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THE FESTIVUS

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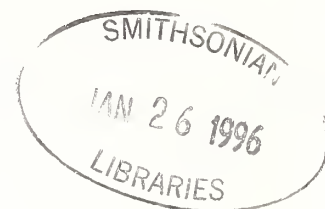
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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park



PROGRAM

Travel, Diving and Shells in the Philippines

Dave Mulliner, Club member and The Festivus staff photographer, will give an all new slide program on the Philippine Islands. He will also have a display of Philippine material.

also

Giant Reprint Sale

Meeting date: January 18, 1996
Shells of the month: Philippine shells

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CLUB NEWS

Dr. Rüdiger Bieler Joins The Festivus Review Board

It is with appreciation and pride that we welcome Dr. Rüdiger Bieler to **The Festivus** review board. Dr. Bieler, curator of mollusks at the Field Museum of Natural History in Chicago, has written extensively on marine gastropods with major works on the Architectonicidae. Our thanks to him for accepting this position despite his already very busy schedule.

The Annual Christmas Dinner Party

This year the Club Christmas dinner party was held on Saturday evening, December 2nd in the Montfield Room of the Four Points Sheraton Inn. The room was gaily decorated with full-size Christmas tree and table centerpieces of *Strombus gigas* (donated by Don Pisor) planted with brilliant-red poinsettias. Over 45 members were in attendance and the room was filled with the sounds of friends happy being together for this final social event of the year.

Following the cocktail hour and the very fine dinner, the board members for 1996 were installed and those who had served in 1995, both behind the scenes and on the board, were thanked by outgoing president, Kay Klaus. Members then enjoyed the traditional gift exchange, this year followed by a drawing for the beautiful centerpieces and a slide show which included images from the September party and the exciting activities of several members. The evening was a special one for all present.

From the Minutes of the Meeting of the San Diego Shell Club, November 16, 1995

Kay opened the meeting at 7:45 p.m. The Club welcomed back old friend Michael Hollmann visiting from Germany and new member Rick Schaefer. Kay reminded everyone of the Christmas party on Saturday December 2nd at the Four Points Sheraton with Hugh Bradner as emcee for the event. Kay thanked Chuck Reitz for bringing the refreshments for the evening.

The election of officers for 1996 took place with nominees elected unanimously. The new officers will be: Bill Romer, President; Terry Arnold, Vice-

President; Margaret Mulliner, Treasurer; Silvana Vollero, Recording Secretary; and Kim Hutsell, Corresponding Secretary. There was a warm round of applause for Kay, our outgoing President.

Don Shasky mentioned interesting articles in the latest issues of **The Nautilus** and **Australian Shell News** and the meeting in Perth from February 1-4, 1997. Hugh read two obituaries. R. Tucker Abbott passed away in November and Gale G. Sphon, Jr. passed away in May (see p. 11).

Jules introduced the speaker for the evening, Dr. Henry Chaney. Hank spoke on the Solomon Islands which he described as the intersection of the Pacific. It is becoming a more popular place for divers since it is rich in mollusks. For now, at least, marine areas have not been impacted. It was quite a fascinating presentation.

The shell drawing winner was George Kennedy. The meeting was adjourned to enjoy the refreshments and shell talk and viewing some great shells brought in for display.

Silvana Vollero

Dues are Due

For those who have not paid their dues for 1996, this will be your last issue. Only those members in good standing will receive the February issue and appear on the membership roster.

International Abalone Symposium*

California Sea Grant is sponsoring the Third International Abalone Symposium in Monterey, California, October 5-11, 1997. Topics to be discussed include the biology, culture and fisheries management of abalone worldwide. There will also be a trade show and a proceedings will be published in a special issue of the **Journal of Shellfish Research**.

If you would like to participate in any way in this international symposium and would like to receive further announcements and registration information, contact Catherine Ashley, California Sea Grant College, 9500 Gilman Dr., La Jolla CA 92093-0232; FAX 619-534-2231; email: cashley@ucsd.edu.

*from Sea Grant Extension Program Newsletter

STRANGE VARIANT OF *MUREXIELLA LAPPA* FROM THE GALÁPAGOS OR AN UNDESCRIBED SPECIES?

CAROLE M. HERTZ

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

Recently, a problem came to my attention concerning the identification of some specimens in the Kirstie L. Kaiser collection from the Islas Galápagos. One was a mature specimen collected by the Ameripagos Expedition in 1971, and now in the Kaiser collection, along with two other juvenile specimens collected by K. L. Kaiser in February 1988. (Three other specimens examined, also collected by the Ameripagos Expedition, are retained in the Mulliner collection.)

After several people had examined the mature specimen in the Kaiser collection, with differing ideas

on its identification, each person noting that it didn't "look exactly right" for the species suggested, I wrote to Dr. Emily Vokes requesting permission to send photos of the four more mature specimens as well as the juvenile specimens for her appraisal. As always, she graciously offered to examine the specimens, and I sent them to her, along with a mature specimen of *Murexiella lappa* (Broderip, 1833) from Panama, from the Carol Skoglund collection, which we had studied for comparison (Figure 1).

In Dr. Vokes' response she clearly noted that the

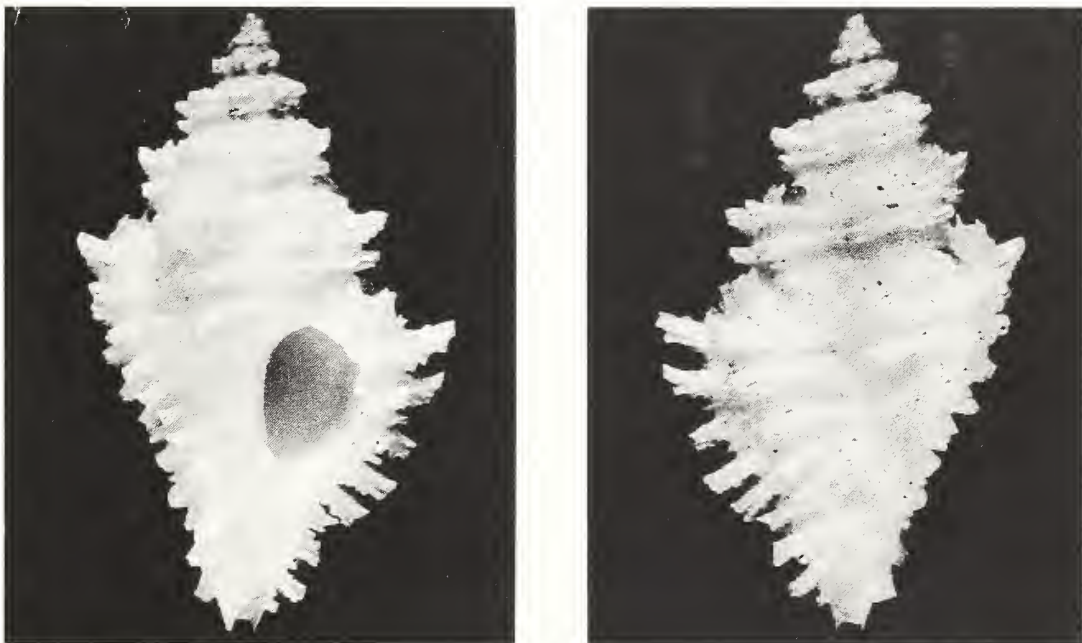


Figure 1. *Murexiella lappa* (Broderip, 1833), 22.9 mm L., apertural and dorsal views. Collected at Isla Venado, Canal Zone, Panamá on rocks, night low tide, February 26, 1967. Leg. Ann Marti. C. Skoglund collection. Photos: D. K. Mulliner.

Panama specimen was a typical *Murexiella lappa* (Broderip, 1833), but that the others (Figures 2-5) "are not any species I recognize, and it is my opinion that they are just a strange variant of *M. lappa*. But they may well be a new species, as the Galápagos are wont to develop." Dr. Vokes suggested that they be referred to as "sp. cf. *lappa*, as they are closer to that than anything else. Certainly they are not *vittata*, *exigua*, *venustula*, *radicata* or any other species I know of from this part of the world!"

Figured here also (Figure 6), is the protoconch of the 15.4 mm specimen from the Mulliner

collection. Although there is a slightly abraded area on the first nuclear whorl, the illustrations clearly show a protoconch of $3\frac{1}{4}$ - $3\frac{1}{2}$ rounded, rough-surfaced whorls.

ACKNOWLEDGMENTS

Joyce Gemmell did the camera lucida drawings of the protoconch of *M. cf. lappa*, David K. Mulliner took the photographs of the specimens and Emily H. Vokes identified the material for me. I thank them for their considerable help.



Figure 2. *Murexiella* cf. *lappa*, 25.6 mm L, apertural and dorsal views. Leg. D. K. Mulliner (Ameripagos Expedition) at Pta. Alfaro, Isla Isabela, Islas Galápagos, Ecuador at Station 29, in 3-6 m (10-20 ft.), March, 1971. Photos: D. K. Mulliner.

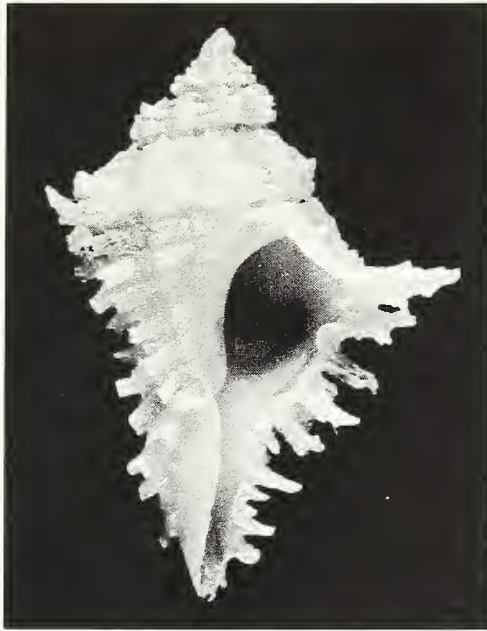


Figure 3. *M. cf. lappa*, 15.4 mm L, apertural and dorsal views. Leg. D. K. Mulliner (Ameripagos Expedition) at Sombrero Chino, Isla Isabela [0°22'20"S to 0°25'20"S and 90°34'30"W to 90°57'10"W], Islas Galápagos, Ecuador at stations 29 & 23, March 22, 24, 25, 1971. Photos: D.K. Mulliner



Figure 4. *M. cf. lappa*, 19.9 mm L, apertural and dorsal views. Leg. D. K. Mulliner (Ameripagos Expedition) Islas Galápagos, Ecuador, March 1971, Photos: D. K. Mulliner.

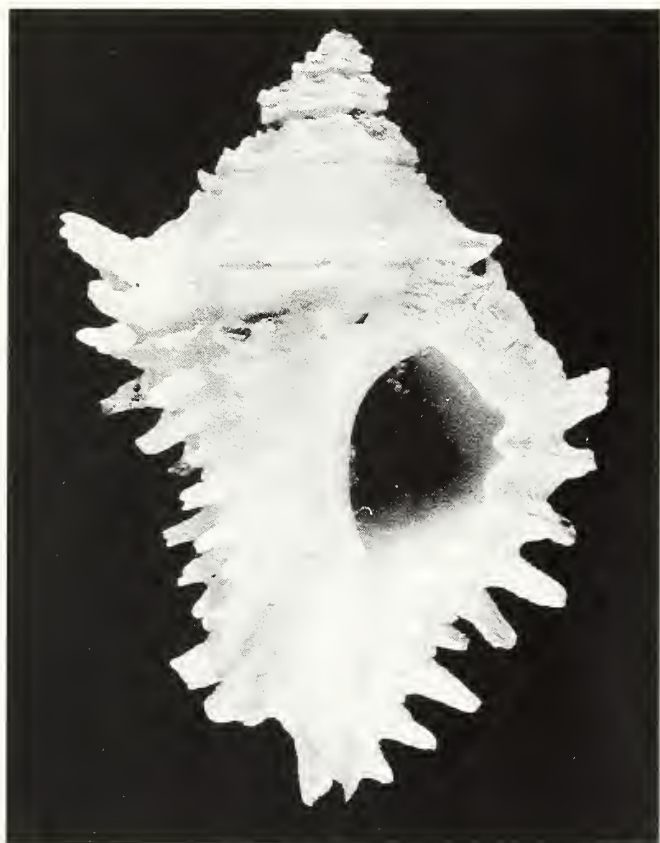


Figure 5. *M. cf. lappa*, 23.5 mm L, apertural and dorsal views. Leg. D.K. Mulliner (Ameripagos Expedition) Pta. Estrada, SE side of Academy Bay, Isla Santa Cruz, in 8-10 m (25-32 ft.), Islas Galápagos, Ecuador, March 19, 1971, K. L. Kaiser collection. Photos: D. K. Mulliner.

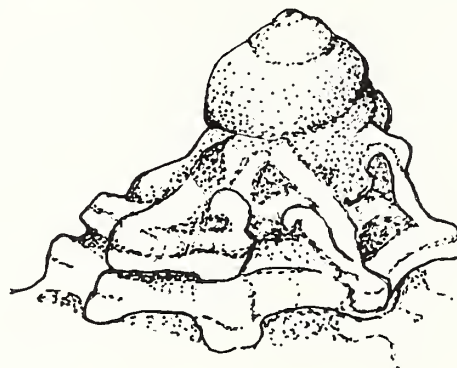
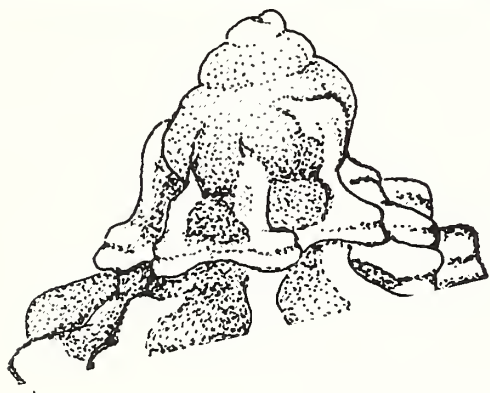


Figure 6. *M. cf. lappa*, two views, apertural and dorsal, of protoconch of specimen illustrated in Figure 3, X25.

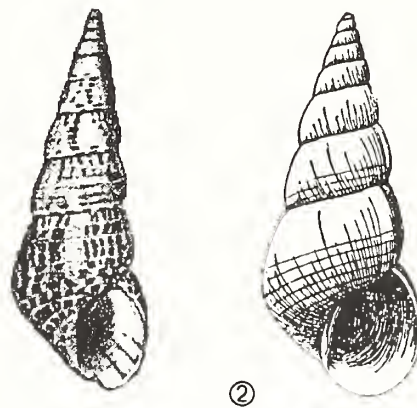
PANAMIC PUZZLES: THOSE ENIGMATIC *ALABA*ROBERT KOCH¹

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

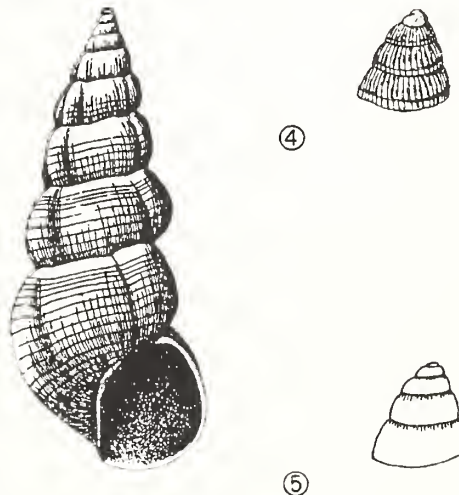
As reported by Keen (1971), there are only four species of the genus *Alaba* residing within the Panamic Province. Of these, three--*interruptilineata* Pilsbry & Lowe, 1932 (Figure 1); *jeannettae* Bartsch, 1910 (Figure 2); and *supralirata* Carpenter, 1857 (Figure 3) -- are said to be found in the Gulf of California, either by original designation or subsequent published range extensions. (See Skoglund, 1992.)

My problems begin with the three Gulf inhabitants as I can't readily distinguish between *jeannettae* and *supralirata*. Using Bartsch's description of *jeannettae* and redescription of *supralirata*, both feature nuclei of four whorls, probably a semitransparent body, incised spiral lines that are stronger toward the base and strong varices. The most distinguishing features are supposedly the placement of the varices and particularly the nucleus. The varices of *jeannettae* are described as "strong, oblique" and placed at "irregular intervals," while those of *supralirata* are "very strong," forming "more or less continuous lines." The nucleus of *supralirata* (Figure 4) features the "first [whorl] smooth; the rest marked by slender, axial riblets," additionally "the last two turns are marked by a slender spiral cord." On the other hand, the nuclear whorls of *jeannettae* (Figure 5) are "smooth except for very faint, slender, axial threads which, in most instances, are only apparent at the summit of the whorls." See Table I.

Under "Specimens examined" Bartsch lists from the Gulf over 2500 *jeannettae* and just 13 *supralirata*. Questions immediately arise concerning the huge assortment. How many are juveniles; the number with recognizable nuclei; the degree of variability? None are answered. There is a hint under *supralirata* where the redescription is based on two of the 13 shells, one furnishing the nucleus. Nevertheless, I simply can't reconcile his figures with my material of 33 Gulf lots,



Figures 1 & 2. (1) *Alaba interruptilineata* Pilsbry & Lowe, 1932. Holotype. 7 mm L [from Pilsbry & Lowe, 1932]. (2) Figure 2. *Alaba jeannettae* Bartsch, 1910. Presumably the holotype, 5 mm L [from Bartsch, 1910].



Figures 3 - 5. (3) *Alaba supralirata* Carpenter, 1857 (USNM 4066) (4) Protoconch of *A. supralirata* [both from Bartsch, 1910]. (5) Protoconch of *A. jeannettae*, presumably the holotype [from Bartsch, 1910].

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collected from Puerto Peñasco, Sonora, south to Los Frailes, Baja California Sur. Some 22 of these lots contain a half-dozen to well over 100 shells. At least 200 have the nucleus intact with recognizable sculpture, and, this is where I run into trouble.

In any of my larger lots the variability factor becomes quite evident. The color varies from chalk-white (old, dead) to semitransparent (fresh dead, animal missing) to a light yellowish-brown shading with white varices where the dried animal is within. In the latter instance, the shell must be somewhat transparent as the animal is plainly visible. In addition, some 20 lots contain one or more shells displaying some evidence of an interrupted color band. In the larger lots the only consistent feature of the varices seems to be that they are, or were, white. Otherwise, there are all sorts of varical variations: from quite strong to very weak; from linear (*supralirata*) to irregular (*jeannettae*); from initially appearing at earlier to later stages of shell growth. The contour or profile of the shells display a similar diversity, ranging, on a relative basis, from a very broad form to a quite slender one. This might be illustrated by the Carpenter drawings of *A. supralirata* in Brann (1966) (Figure 6): a more or less slender adult or subadult and a much broader juvenile form.

The similar shapes of the nuclei are as illustrated by Bartsch for *jeannettae* and *supralirata* (Figures 4, 5) i.e., a tip followed by 4 whorls, the last two expanding rapidly. Possibly the tips may be a trifle more elevated than the impression given in his illustrations. Their outlines conform to that of the teleoconchs, from broad to slender. But the similarity ceases with the sculpture, where variability becomes obvious. The preponderance of my material displays some evidence of riblets. Some evince strong, clearly visible (at 40X) riblets, others a vague, faint type and still in others the tiny ribs are only visible toward the summit and/or base of the last whorls. A number have what might be termed a "frosted" appearance and may be smooth. The riblets are more readily defined on the larger, final two whorls and a few show the "slender, spiral cord" attributed to *supralirata* by Bartsch.

Although noted as different species by authors (i.e. J. Hertz, 1978; Gemmell, Hertz & Myers, 1980; Finet, 1985, 1994), I feel *jeannettae* and *supralirata* could well be conspecific, evidencing a high degree of variability, and to this complex, the slender form of *interruptilineata* might be added. To my mind, the only apparent difference is the color pattern of interrupted brownish bands. But this color feature, as previously noted, also is present in a number of my

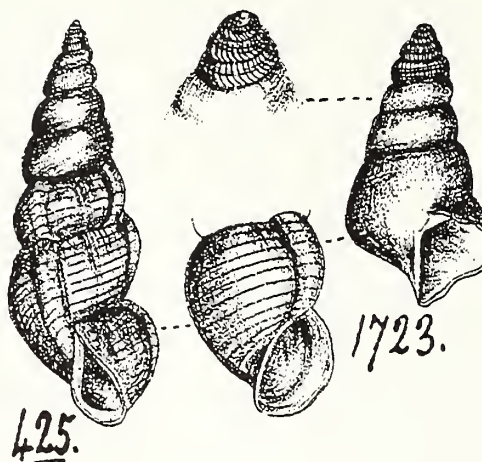


Figure 6. *A. supralirata*. Protoconch and two other specimens [from Carpenter, 1857, illustrated by Brann, 1966].

lots. And, in Carpenter's original description of *supralirata* there is mention of "a rusty brown in irregular stripes," as well as a brief discussion of the variability in his modest type lot.

Alaba guayaquilensis Bartsch, 1928, (Figure 7) from Ecuador, remains a mystery. I have sizable lots -- well over 300 shells, some live taken -- collected at Salinas. All are representative of the other three species. There is nothing that even remotely matches Bartsch's brief and less than satisfactory description which only mentions the single type specimen. It may be a valid species, but I can find no subsequent reference to the shell.



Figure 7. *Alaba guayaquilensis* Bartsch, 1928 [from Bartsch, 1928].

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Table I. Comparison of Four *Alaba* Species

Keen #	Species, Range and Length	Nucleus	Body Color	Body Sculpture	Varices
559	<i>guayaquilensis</i> : Ecuador (type) 5.7 mm	not indicated as such, but probably 3 whorls, well-rounded, smooth, flesh-colored	horn-brown (no mention of color pattern as illustrated)	5 incised spiral lines	strong, almost vertical, flesh-colored
560	<i>interruptilineata</i> : Nicaragua (type) 7.0 mm Nicaragua to Panama (per Keen) Peru & Sonora (see Skoglund, 1992)	as in <i>supralirata</i> (no color mentioned)	semitransparent, interrupted bands of chestnut brown over entire uneroded surface	incised spiral lines gradually increasing in number	scattered at irregular intervals, white
561	<i>jeannettae</i> : Pacific Baja (type) 5.0 mm San Diego to the Gulf (per Bartsch)	4 whorls, well rounded, smooth, except for very faint axials, in most instances, only apparent at summits (no color mentioned)	semitransparent	incised spiral lines, stronger toward base	strong, scattered at irregular intervals
562	<i>supralirata</i> : Mazatlán (type) 4.8 mm (Carpenter) Gulf to Panama (per Keen); Galápagos (see Skoglund); 6.8 mm (per Bartsch); 4.0 mm (per Gemmell <i>et al.</i>)	4 whorls, 1st smooth, rest with axial riblets, last 2 with slender spiral cord (no color mentioned)	semitransparent (per Bartsch) "porcellaneous white a rusty brown in irregular stripes" (per Carpenter)	1st 3 whorls smooth, followed by incised lines increasing in size & pronounced on final whorls	very strong, more or less continuous lines over the whorls

CHECK ALL YOUR VALVES

GIJS C. KRONENBERG

c/o Milieu Educatie Centrum, PO Box 435, NL-5600 AK Eindhoven, the Netherlands

Several years ago, in 1988 to be precise, I went along on a tour to Egypt to get a bit of ancient Egyptian culture, and also to collect shells in the Red Sea. At one particular spot I found a rather large specimen of *Tridacna maxima*, lying at a depth of about four meters, plainly in sight on the sand just in front of the reef. It looked very nice, although it had some other organisms, like sponges, on it. So, I collected it (it was by no means part of the reef itself).

Upon arriving back home, it was one of the first shells I needed to clean. No need to guess why. My partner, Marianne, offered her help. Suddenly she drew my attention by pointing to a small cone still present on one of the valves. Well, that was a surprise. And upon closer examination we found some more during this "house collecting." All species measured less than 5 mm:

Stomatella varia (A. Adams, 1850)
Rissoina (Rissoina) ambigua (Gould, 1849)
Bitium zebrum (Kiener, 1843)
Viriola corrugata (Hinds, 1843)
Cronia martensi (Dall, 1823)
Euplica varians (Sowerby, 1832)
Conus (Virroconus) parvatus sharmiensis Wils, 1986
Cylichna girardi (Audoin, 1826)
Pinctada vulgaris (Schumacher, 1817).

Last summer a group of seven paid a visit to Baja California Sur, Mexico, and, of course, we did some collecting. I remembered my experience with the *Tridacna*, and when it happened that my thumb was injured rather seriously, I asked my companions to collect some of the previously sighted broken and scattered valves of *Pinna rugosa* Sowerby, 1835, for me. It was rewarding. On these valves we found

lots of:

Patelloida semirubida (Dall, 1914)
Theodoxus (Vittocliton) luteofasciatus (Miller, 1879)
Hipponix antiquatus panamensis C.B. Adams, 1852
Crepidula nummularia Gould, 1846
Crucibulum (Crucibulum) spinosum (Sowerby, 1824)
Nassarius tiarula (Kiener, 1841)
Costoanachis coronata coronata (Sowerby, 1832)
Thala gratiosa (Reeve, 1845) (one specimen).

On and near valves of *Chama buddiana* C.B. Adams, 1852, we found *Lithophaga (Labis) attenuata* (Deshayes, 1836) and *Gastrochaena cf. rugulosa* Sowerby, 1834. One specimen of *Hyotissa hyotis* Linnaeus, 1758, was completely covered with encrustations inhabited by *Lithophaga (Myoforceps) aristata* (Dillwyn, 1817).

None of the species mentioned here are to be considered rarities. But, besides the rewards in shaking coral (Shasky, 1992, 1995), it can also be rewarding to check all valves.

I would like to thank Henk Dekke from Winkel, the Netherlands, for his help in identifying the Red Sea specimens and Marianne for her help in cleaning shells and her lasting support.

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In Memoriam

R. Tucker Abbott
1918-1995

It is with great sadness that we report the passing of Dr. R. Tucker Abbott, a great friend of malacology, affectionately known as Mr. Seashell. It can be said that the considerable degree of interest in mollusks by amateurs can be credited in large part to Dr. Abbott's enthusiasm and the many books he wrote for the amateur as well as the professional audience, among the most popular his landmark **American Seashells** (2nd edition), **Compendium of Seashells**, **Kingdom of the Seashell**, and **Compendium of Landshells**.

His professional career included an associate curatorship at the Smithsonian Institution, Chairman of the Department of Mollusks at the Academy of Natural Sciences, Philadelphia, and Chairman of the Department of Mollusks at the Delaware Museum of Natural History. He established the journal **Indo-Pacific Mollusca**, for many years was editor of **The Nautilus** and later began publishing works of other authors when he set up **American Malacologists** in 1973. His latest and last venture was as the guiding light and director of the newly-opened Bailey-Matthews Shell Museum in Sanibel, Florida.

Tucker was a longtime member of the San Diego Shell Club serving on **The Festivus** review board since its inception in 1985. He is survived by his wife, Cecilia, three children, three stepchildren and five grandchildren.

Gale G. Sphon, Jr.
1934-1995

We sadly announce the death of Gale G. Sphon, Jr. Long a worker in malacology, in the Santa Barbara Museum of Natural History in the 1960s and later the Los Angeles County Museum of Natural History from which he retired in 1992 after 24 years. He had written a number of professional papers and been an early member of the San Diego Shell Club. He is survived by his sister, Barbara Walker.

The R. Tucker Abbott Memorial Fund

The Bailey-Matthews Shell Museum seeks to establish The R. Tucker Abbott Memorial Fund in honor of the Founding Director of the Shell Museum on Sanibel Island in southwest Florida. The aim is "to raise sufficient funds to establish The R. Tucker Abbott Chair, an annual lectureship and educational program in conchological science, to which the public will be invited." To support this fund, send checks payable to Bailey-Matthews Shell Museum, P.O. Box 1580, Sanibel, FL 33957, USA.

1996 LOW TIDES FOR THE NORTHERN GULF OF CALIFORNIA

The entries below show periods of low tides of -4.0 feet and below. The times of low tides are given in Mountain Standard Time. To correct for San Felipe, subtract one hour from

listed times which are for Puerto Peñasco (San Felipe is on Pacific Standard Time). Tides below the midriff of the Gulf cannot be estimated using these entries.

January 18	-4.0 ft. at 6:15 p.m.	March 19	-4.0 ft. at 8:00 a.m.	July 1	-4.3 ft. at 7:45 a.m.
January 19	-5.5 ft. at 7:00 p.m.	March 20	-4.0 ft. at 8:30 a.m.	July 2	-4.2 ft. at 8:15 a.m.
January 20	-6.0 ft. at 8:00 p.m.	April 17	-4.0 ft. at 7:15 a.m.	July 30	-4.3 ft. at 7:15 a.m.
January 21	-5.2 ft. at 8:30 p.m.	April 18	-4.0 ft. at 8:00 a.m.	July 31	-4.2 ft. at 8:00 a.m.
February 16	-4.0 ft. at 6:15 p.m.	May 3	-4.0 ft. at 7:15 a.m.	August 28	-4.1 ft. at 7:15 a.m.
February 17	-5.3 ft. at 7:00 p.m.	May 4	-4.1 ft. at 8:00 a.m.	August 29	-4.0 ft. at 8:00 a.m.
February 18	-5.7 ft. at 8:00 p.m.	June 1	-4.0 ft. at 7:15 a.m.	December 9	-4.0 ft. at 7:00 p.m.
February 19	-5.0 ft. at 8:40 p.m.	June 2	-4.3 ft. at 8:00 a.m.	December 10	-4.3 ft. at 7:45 p.m.
March 17	-4.0 ft. at 7:00 p.m.	June 3	-4.1 ft. at 8:30 a.m.	December 11	-4.2 ft. at 8:15 p.m.
March 18	-4.1 ft. at 7:45 p.m.	June 30	-4.0 ft. at 7:00 a.m.	December 12	-4.0 ft. at 9:00 p.m.

Notices of New Publications

The Lure of the Liguus: The Florida Tree Snails by Henry Close has been published by **Of Sea & Shore Publications**. Based on an original series of articles published in **Of Sea and Shore**, the 140+page, spiral-bound book expands the original series, adding "38 pages of maps, tables and additional information, plus three full page color plates and a color cover." To order, send \$19.95 plus postage to Of Sea & Shore Publications, P.O. Box 219, Port Gamble, WA 98364-0219. Postage: add \$3 US; \$3.50 Canada & Mexico; \$5.50 western Hemisphere; \$7.50 Europe; \$8.50 Asia & Africa; \$9.50 Pacific Rim (all air mail).

Seashells of Central New South Wales a Survey of the Shelled Marine Molluscs of the Sydney Metropolitan Area and Adjacent Coasts by Patty Jensen is "the first ever to be published on shells of New South Wales. Four hundred and eighty-four species are described and illustrated, representing most species that can be found on beaches in central New South Wales. Ranges outside this area are mentioned. The book includes sections on gastropods, bivalves and scaphopods....[and] describes micromolluscs from families such as the Rissoidae and Pyramidellidae...information on the mode of life and ecology of the animals is included." Priced at \$40 Australian. For further information on price and overseas postage, write to Filejest Pty. Ltd., 11 Eden St., Belgian Gardens, Qld, 4810, Australia.

Seashells of Eastern Arabia by Donald T. Bosch, S. Peter Dance, Robert G. Moolenbeek & P. Graham Oliver is "the first book to be devoted to the seashells of Oman and the Arabian Gulf...over 1,000 species described in layman's language...original colour photographs, scanning electron microscope images and line drawings illustrate most species." Priced at \$75 US with an additional \$16 packing and postage. To order send to Motivate Publishing, London House, 19 Old Court Place, Kensington High Street, London W8 4PL England.

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THE FESTIVUS

A publication of the San Diego Shell Club

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

PROGRAM

"Branching" in the Philippines -- Revisited

Mike Miller, award winning member of the Underwater Photographic Society, will give a slide presentation on his recent trip to the Philippines. Mike, who has been

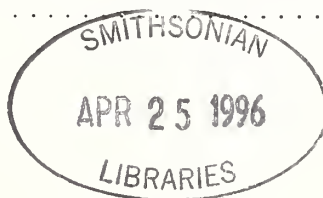
diving the Philippines for about fifteen years, gave an outstanding program to the Club, "Butterflies of the Sea," in 1992.

Meeting date: February 15, 1996

Shells of the month: Opisthobranchs (Bubbles, Branches & more)

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CLUB NEWS

Volumes of The Veliger Available

As a result of generous donations by members and friends, a number of complete volumes of **The Veliger**, some out of print, as well as individual issues are available for sale. Complete volumes can be purchased for \$40 each and individual issues at \$10 each. Postage is included. (For overseas addresses, the issues will be sent surface mail).

Complete volumes: 9-14 and 23-29

Individual issues: 2(4); 8(4); 9(4); 13(1); 14(2)
28(1); 36(1); 37(1,2); 38(1,2,4)
and 39(1).

For further information, call Carole Hertz (619) 277-6259 or Margaret Mulliner (619) 488-2701.

Club Committees for 1996

In addition to the elected officers and staff listed on the masthead, the Club requires the work of a number of committees to keep the Club operating. They are as follows: Librarian: Margaret Mulliner

Parliamentarian: Jules Hertz

COA Rep: Don Pisor

Telephone: Vi Thomas, Don Shasky & Linda
& John LaGrange

The following three committees are in search of volunteers: Botanical Garden Foundation Rep., Host, and Publicity. If you are able to help, please contact President Bill Romer at (619) 278-2389.

A Date for the Auction/Potluck

The 1996 Annual Auction/Potluck will be held on Saturday evening, April 20th. Thanks to the kindness of Wes Farmer, it will again be held in the clubhouse at his condo -- an absolutely ideal location. (Details and map later.)

It is not too early to begin thinking about the Auction. Members (and friends) are asked to begin bringing in donations for this, the biggest social event of the year and the Club's most important fundraiser. Look through your collections and find some quality shells, with collecting data where possible, and either bring your donations to a Club meeting or contact a board member and arrange for pickup.

Be generous, the Club needs your help!

Mark Your Calendars

It's hard to believe, but the date for the 1996 Christmas Party has already been reserved. Since the party was so successful in '95, it will again be held at the Four Points Hotel (Sheraton) near Montgomery Field on the second Saturday in December -- the 14th.

From the Minutes of the Meeting of the San Diego Shell Club, 18 January 1996

President Bill Romer called the first meeting of the year to order at 7:45 p.m. After introduction of guests, several announcements were made. Members were urged to look over the reprints on sale, volunteer for committees and to sign up to bring refreshments for the monthly meetings. Dates were announced for the Club Auction Potluck and the Christmas Party. Dates and volunteer hosts are needed for the Bizarre Bazaar and the September party.

In the absence of Vice President Terry Arnold, Bill introduced the speaker for the evening, Dave Mulliner, longtime member, Festivus staff photographer and award winning underwater photographer, who gave a beautiful program on his most recent visit to the Philippines.

Dave began by taking members on the flight, landing in Manila and staying in accommodations at a beautiful modern hotel. He gave land tours of the city, of the islands on which he stayed, such as Cebu and Batangas, and the people he visited. He showed the markets, the residences and the countryside --and then went underwater. Dave's spectacular photography captured the underwater life of an area he says is one of the most beautiful -- and to which he returns as often as he can. Colorful fish, varieties of sponges, corals, tunicates and mollusks (especially nudibranchs) in their natural habitats were captured by Dave's camera. It was a program greatly enjoyed by all. Along with his talk, Dave had a display of books and beautiful shells from the Philippines.

Following the program, June King was the winner of the door prize.

Members then adjourned to continue rummaging through the reprints, enjoy the social time with friends and the refreshments provided by Larry Catarius and Tom Knapik.

SOME OBSERVATIONS ON *THYCA CALLISTA* BERRY, 1959

GEORGE E. METZ

121 Wild Horse Valley Drive, Novato, California 94947, USA

This small ectoparasite has been mentioned uncommonly in the literature since the original description by Berry in 1959. Bertsch (1975) illustrated the male by means of a SEM photograph, extended the range to Panama and reported the occurrence of the species on two hosts: the asteroids *Phataria unifascialis* (Gray, 1840) and *P. pyramidata* (Gray, 1840). Shasky (1983) mentioned the rare occurrence of the taxon and estimated the infestation rate at one per thousand starfish examined. The taxon has appeared several times in **The Festivus**. Bratcher (1984) while writing about *Thyca crystallina* (Gould, 1846) remarked on the rarity of *T. callista* in her experience again using the estimate of 1 in a 1000. Dushane (1984) followed with her observations on having found several in shallow water. Bertsch (1985) reconfirmed his observations of 1975 and his further experiences with the species. There have been no further observations in the literature.

The life style of this interesting species has long piqued my interest. The finding of the related species, *T. crystallina*, in the Indo-

Pacific, stimulated an intense hunt for *T. callista* in the Gulf of California. As noted in the previous reports, thousands of starfish were molested, until the habitat of *Phataria unifascialis* (rocks) was found and the search narrowed. Infestation rates vary by area. In Bahía Concepción, Baja California Sur, the counted rates were around 1 in 50, while in other more southern areas (Bahía Escondido), the infestation rate is about 1 in 10 with multiple infestations common. As observed by Bertsch (1985), the male lives attached to the female beneath the mantle, presumably fertilizing the eggs resulting in the production of planktonic larvae. Studies of the related species, *T. crystallina*, by Elder (1979), show that, in this species, the larvae apparently settle on the dorsum of the host and migrate, with growth, to the oral side of the host and, with penetration of the proboscis into the asteroid integument, become permanently settled (Figure 1).

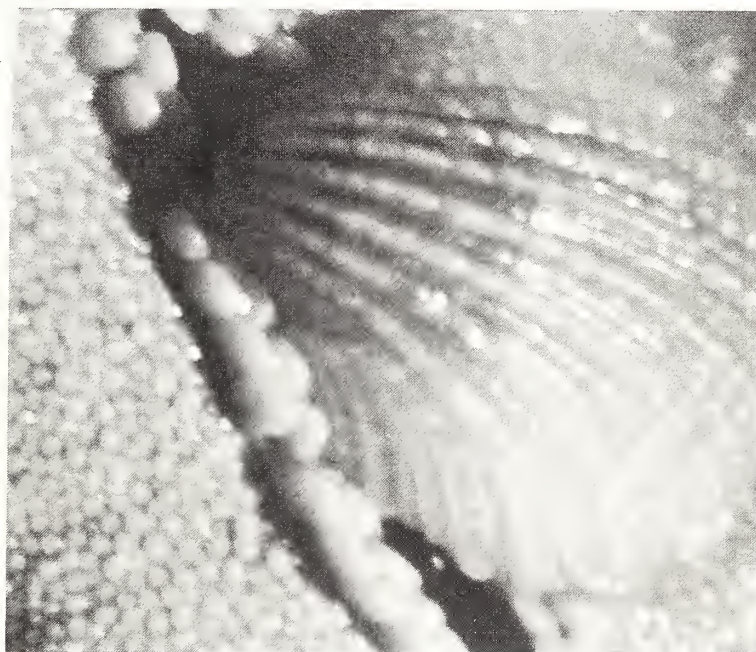


Figure 1. *Thyca callista*, 1.5 mm adult, settled on the dorsum of the seastar *Phataria unifascialis*.

After examining a large number *Phataria unifascialis*, a similar progression of apparent settlement, migration and development was found in *T. callista*. Twelve starfish, all parasitised with *T. callista*, were examined. Five had more than one parasite ranging from 2 to 5, while 7 had only one parasite each. The parasites ranged from 1.5 mm to 10.5 mm. All were carefully removed and examined, both for the presence of a male and for the presence of a penetration of the integument of the host. Parasites larger than 5 mm generally had a penetration site, presumably a permanent attachment. Parasites larger than 6 mm had a male attached beneath the mantle, except for a single 7.2 mm specimen.

The smallest individual found measured 1.5 mm and was found on the dorsum of the host (Figures 2 & 3). It is limpet shaped with the

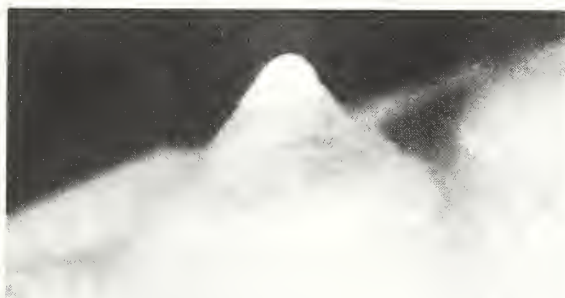


Figure 2. *Thyca callista*, 1.5 mm female on the dorsum of the host.

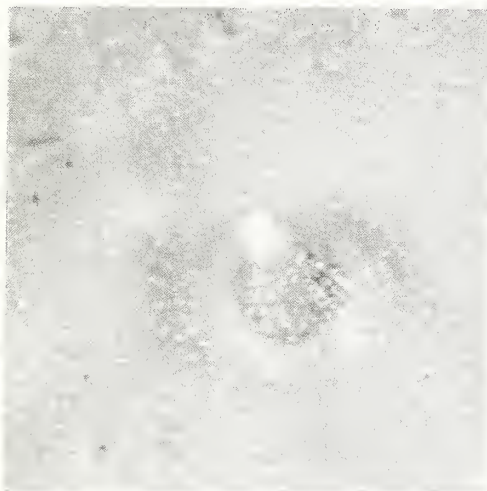


Figure 3. *T. callista*, specimen shown in Figure 2.

apex more toward the center, but possesses the typical protoconch and ribs of the adult female. The next largest specimens were 3 mm and 3.2 mm (Figure 4), both were found on the sides of the arm. The apex has migrated more toward its adult position on the side of the shell. Progressive sizes of 5 mm up to the mature shells which are usually 10 mm all show the adult shape with the protoconch/apex toward the side of the shell and a now well developed shelf characteristic of the subgenera.



Figure 4. *T. callista*, 3.0 mm specimen, on the side of the arm of the seastar.

It appears that *T. callista* parallels the development of *T. crystallina* with settlement of the larva on the dorsum of the host, migration with growth to a position adjacent to the ambulacral groove where the proboscis penetrates the host and a permanent position is established.

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DOES A NEW WAX HAVE A PLACE IN YOUR COLLECTION?

In recent years, **The Festivus** has published some articles by Larry Buck (1991; 1995) on the cleaning of shells. Larry has recently brought to our attention an article by Ignelzi (1994) on the uses of a particular sticky wax and Larry has postulated on its possible applications by shell collectors.

The wax, known as Quake Wax, is commercially available from Conservation Materials Ltd., and has been used to stabilize precious artifacts in such places as the J. Paul Getty Museum and the Huntington Gallery. Ignelzi reported that unlike other adhesives evaluated which were bulky and weak-bonding, Quake Wax is extremely sticky and holds securely. It doesn't penetrate the object being secured and doesn't damage such surfaces as furniture to which the objects are being held. Small pieces of wax are kneaded until soft and then used for securing large or small objects, with larger or heavier objects requiring as many as a dozen bits of wax.

Removing the objects is a little trickier, and

Ignelzi suggests sawing through the wax with dental floss and removing the waxy residue with paint thinner.

The many possible uses for shell collectors are only limited by the collectors' imaginations. Larry Buck suggests fixing large shells in place in viewing cabinets and possibly using the wax for keeping bivalves closed. Other possibilities might be for fixing shells in place in exhibits which are to be moved and for use by shell photographers in the mounting of shells on pins prior to photographing.

More information and pricing on Quake Wax can be obtained by calling (702) 331-0582.

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THE CORRESPONDENCE BETWEEN M. M. SCHEPMAN AND W. H. DALL

A. N. van der BIJL

Associate, Zoölogisch Museum Amsterdam, Postbus 94766, 1090 GT,
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This paper deals, in chronological order, with the letters written by Mattheus Marinus Schepman (1847-1919), the most important malacologist of the Netherlands around the turn of the century, to William Healey Dall.

Dall (1845-1927) was an eminent American malacologist who worked at the United States National Museum as Honorary Curator of the Division of Mollusks and Tertiary Fossils from 1868 until his death in 1927. Although Dall passed through the Netherlands in 1878 (Bartsch *et al.*, 1946:9), one may presume that they knew each other only from mutual correspondence.

From the request of Professor Max W. C. Weber, leader of the *Siboga Expedition* to the Dutch East Indies in 1899-1900, Schepman studied a large part of the gastropods collected during the expedition. During his research, he regularly needed literature which he was unable to find in the Netherlands. At such times he contacted Weber for assistance.

When Schepman was working on the *Gymnoglossa*, he needed a publication on *Pyramidellidae* written by Dall & Bartsch in 1904. In a letter dated 23 December 1908, he asked Weber for help. Most likely Weber could not be of help and advised him to write to Dall for the information. In correspondence dated 30 December 1908, Schepman wrote to Weber confirming that he had followed his advice.

Schepman's letter to Dall on 24 December 1908 was the first of several. Schepman sent Dall a reprint of his paper on the molluscs of Taliabu, one of the Xulla Islands, and asked Dall for a reprint of his paper on the *Pyramidellidae*. Apparently Dall fulfilled his request, because when dealing with the species *Pyramidella (Milda) ventricosa*, Schepman (1909b:242) followed the opinion of Dall & Bartsch (1904:4) concerning the authorship of *P. (M.) ventricosa*. Schepman also told Dall what he was currently working on. In Dall's reply, he probably mentioned his

publication on the molluscs and brachiopods collected during the expedition with the *Albatross*.

In a letter dated 22 October 1909, Schepman wrote that he was interested in Dall's publication on the *Albatross* expedition, and should be glad to receive it from Dall. From the same letter, one can conclude that Schepman had already sent Part II (*Taenioglossa* & *Ptenoglossa*) of his *Siboga* reports to Dall and also promised him Part I (*Rhipidoglossa* & *Docoglossa*) in the event he had not already sent it to him.

In a letter of 17 November 1909, Schepman wrote that he had received the book on the molluscs collected during the expedition of the *Albatross*. His first impression was that it would be very useful for him. He also mentioned that he had sent Part I of his *Siboga* reports and promised him all the following parts (III-VI). At the end of the letter, Schepman confided that a minor part of Part III was ready for printing, but that he was not completely satisfied with his results, as he had to deal with poor quality material in small quantities. The cover page of Part III gives November 1909 as the date of publication and in the preface Schepman mentions the problems he had with this group.

In a letter to Dall dated 31 March 1910, Schepman wrote to Dall that he had sent him Part III of the *Siboga* reports and that he should be glad to receive the report on the molluscs of Peru that Dall had promised him. Apparently Dall was occupied with moving the mollusc collection in the United States National Museum (USNM), which was stored in 7000 drawers. "What a heap of work!" stated Schepman, who had just moved his own collection, consisting of about 230 drawers, nearly a year earlier, from Rhoon to Bosch en Duin.

In a letter of 19 April 1910, Schepman wrote that he had received Dall's report on the molluscs of Peru

and the monograph on the Pyramidellidae. Schepman commented that writing a monograph seemed a lot of work to him and he thought that both publications would be useful to him. Schepman told Dall he was working on the Rachiglossa and had found several new species. He promised Part IV to Dall, but told him that it would take some time before it was completed as he still had to work on the genera *Nassa* and *Columbella*. Particularly in the genus *Nassa* he had to deal with a lot of material. In Part IV Schepman mentions 47 species of this genus. He describes 7 new species and 2 new varieties.

On 20 April 1910 Schepman wrote a short additional note under his letter. For mailing, Dall had used the service of the Bureau Scientifique Central Néerlandais at Leiden. Schepman explained that the mailing took 3 months and that he had to pay 25 cents. This was no problem for Schepman because the books were worth more than 25 cents, but he presumed that Dall also had paid for it so he recommended not using the Bureau Scientifique Central Néerlandais at Leiden.

In Part I of the *Siboga* reports, Schepman concluded that the subgenus *Neritilia* was considered a separate genus, which was then placed in a new family Neritilidae. Published in September 1911 was Part IV, in which Schepman deals with the Rachiglossa of the *Siboga* expedition. From the preface it can be concluded that Dr. H. Simroth and Professor J. Thiele did not agree with Schepman on his new family Neritilidae. Thiele recognized *Neritilia* as a genus, but thought that it should be placed in the already existing family Neritidae. Simroth (1910:27) did not agree with Schepman's division into two families because it was based on shell characters only. Simroth preferred the division made by G. C. Bourne, as it was based on anatomical characters. Schepman accused Simroth of not having read his text well enough because his division was also based on anatomical characters, namely the research on the radula. Contrary to Simroth, Schepman could not agree with the division made by Bourne.

As promised earlier, Schepman sent Dall Part IV of his *Siboga* reports. In a letter of 24 November 1911, Dall probably acknowledged that he had received it as Schepman replied 25 December 1911. Schepman was glad to hear that Dall agreed with him concerning *Neritilia*.

In the recent classification by Vaught (1989:13), the family Neritilidae is mentioned as subfamily Neritiliinae, part of the family Neritidae. The subfamily Neritiliinae contains the genera *Neritilia* and

Septariellina. The separate location of the genus *Neritilia* within the Neritidae in Vaught's classification can be seen as evidence that Schepman was thinking in the right direction.

Schepman advised Dall to wait before binding the *Siboga* reports because the set was not yet complete. Of the Toxoglossa for Part V, Schepman had already finished the Terebridae and the Conidae and was currently occupied with the Pleurotomidae, a very difficult family in his opinion. In several letters to Weber (3 February 1911, 24 November 1911 and 23 July 1912), Schepman wrote about his problems with this family. Schepman hoped that he would finish the Toxoglossa during 1912. He had already finished Part VI, dealing with the pulmonates. At last Schepman wrote that he would be glad to receive the article Dall had promised him. Schepman wished Dall luck with his work on his "Manual of N.W. American Shells." As far as I know, Dall never published a book with this title and they may have been speaking of a book that was published in 1921.

In Schepman's last letter to Dall dated from 24 May 1912, he thanked Dall for the reprints he had sent. Schepman thought that they, just like Dall's other publications he had received in the past, would be very interesting. Schepman confided that he had finished his work on the molluscs of the *Siboga* expedition, but that it would take some time before the results were published. Part V was published in April 1913 and Part VI in May 1913.

Dall (Dance, 1966:119), in the beginning of the 20th Century was more or less responsible for the introduction of the malacological nomenclature published by P. F. Röding in 1798.

At the time J.F. Bolten died in 1796, he owned an enormous shell collection. Röding published a catalogue of the Bolten Collection using a manuscript-catalogue that Bolten himself had compiled. Bolten had introduced his own malacological order, and Röding annotated the catalogue by adding synonyms and references to the figures from other resources. The Bolten nomenclature published by Röding was not used extensively because the Bolten catalogue was poorly known.

Although Dall did not have much support in the beginning, he encouraged other workers to use the Bolten nomenclature and as a result, many well known names, including some introduced by Lamarck, became junior synonyms.

In a letter dated 19 December 1917 to Miss J. Scholten, who like Schepman was a member of the

Mollusken Comité occupied with studying the distribution of mollusks in the Netherlands (Coomans, 1968:57), Schepman referred to Dall's mentioning that he liked using Röding's names from the Bolten catalogue. Scholten had asked Schepman a question concerning the genera *Chrysodomus* Swainson, 1840 and *Neptunea* Röding, 1798. Schepman wrote in his letter that he, just like Dautzenberg, had started to use the Röding name *Neptunea*, but that he, nevertheless, was not as enthusiastic about the Bolten catalogue as was Dall.

After Schepman's death in 1919, his collections of books and shells were auctioned off in 1920. Two publications by Dall were offered as single lots (Anon., 1920:18, nos. 447 & 478), the monograph on the Pyramidellidae, which was mentioned in the letter dated 10 April 1910, and the monograph on the molluscan fauna of Florida, which was published in 1915, some years after the last remaining correspondence with Dall. It is not known who purchased these publications. The other publications by Dall probably could have been found in three lots in which publication of numerous authors were assembled (Anon., 1920:21, nos 561-563).

Schepman's original letters to Dall are in the Smithsonian Institution Archives (SIA 73, box 81, folder 1), Washington, D.C. Schepman's original letters to Weber and Scholten are in the library of the Department of Malacology of the Zoölogisch Museum, Amsterdam.

ACKNOWLEDGMENTS

I thank Dr. A. R. Kabat (National Museum of Natural History, Smithsonian Institution, Washington D.C., USA), who provided me with copies and transcriptions of Schepman's letters to Dall; Mr. R.G. Moolenbeek (Zoölogisch Museum, Amsterdam, the Netherlands), and Mrs. K.L. Kaiser who reviewed the text.

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SUBCANCILLA HINDSII (REEVE, 1844):
A CORRECTION FOR A FIGURE IN KEEN (1971)

CAROL SKOGLUND

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2559 Puesta del Sol Road, Santa Barbara, California 93105, USA

In going through the marginal notes made by S. Stillman Berry in his copy of *Sea Shells of Tropical West America*, the following error came to light.

Dr. Berry noted that Figure 1440 in Keen (1971) for *Subcancilla hindsii* (Reeve, 1844) is actually a photograph of his paratype SSB 2462a of *Subcancilla calodinata* (Berry, 1960). The error was also noted on the label of the Berry paratype now at the Santa Barbara Museum of Natural History.

Cernohorsky (1991) figured the drawing of *Mitra hindsii* from Reeve, and made the species a synonym of *Subcancilla attenuata* (Broderip, 1836). Reeve's type figure of *Mitra hindsii* (Figure 1) is repeated here for comparison with the Keen figure.

Thanks to Dr. Dwight W. Taylor for calling this to my attention, to Paul Scott for use of the material at the Santa Barbara Museum of Natural History and to David Mulliner for the photography

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Figure 1. *Mitra hindsii* Reeve, 1844. From Reeve (1844, Plate 21, Species 165). Photo: D. K. Mulliner.

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THE FESTIVUS

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Meeting date: third Thursday, 7:30 PM
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PROGRAM

Byne's Disease, History, Causes and Prevention

Sally Shelton, Director of Collections, Care and Conservation at the San Diego Natural History Museum, is a recognized expert in collection care. She

has lectured in the United States and Europe and will discuss the problem of Bynne's Disease in shell collections. She will have demonstration materials and handouts.

Meeting date: March 21, 1996
Shells of the month: --- *Latiaxis*

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From the Minutes of the Meeting of the San Diego Shell Club, 15 February 1996

Bill Romer called the meeting to order at 7:45 p.m. The minutes for last month's meeting were approved as published in *The Festivus*. Bill reminded members that we are still in need of a Host and a Botanical Garden Foundation Rep. He also announced that the Auction will take place at Wes Farmer's clubhouse again this year. Carole Hertz reminded everyone that there is only one meeting left before the auction. Donations can be given to any one of the Club's officers or brought to the March meeting. The Bradners very graciously volunteered to host the Bizarre Bazaar and the Arnolds have offered to host the September party again this year. Dates for the two events will be announced later.

Hugh Bradner reported that a call for papers had been sent out for the WSM annual meeting in San Diego from June 23-27. Bill thanked Ken Trego and Billee Brown for the evening's refreshments.

Terry Arnold introduced the speaker for the evening, Mike Miller. Mike is an underwater photographer. His slides were taken on a recent trip to the Philippines in which he and others found 22 new species of nudibranchs. The colors, patterns and variety of the nudibranchs he shared with us were just incredible. For those interested in receiving further information on this subject, Mike's web site is <http://www.electriciti.com/mdmiller>.

Several members met in January at Kay Klaus' house to discuss shells. The next Saturday session on the second Saturday of the month, March 9, will be on cones. Call Kay for details.

The drawing winner was Bill Romer. The meeting was adjourned at 8:30 p.m. and everyone enjoyed the casual conversation, yummy treats, and viewing the shells brought in by Chuck Reitz.

Silvana Vollero

1996 Annual Meeting of the Western Society of Malacologists in San Diego

The 29th annual WSM meeting will be held from 23-27 June 1996 at the Handlery Hotel and Resort in San Diego.

Three symposia are planned: Biology and Evolution of Cypraeoidea convened by Terry Arnold and Lindsey Groves, Functional Morphology and Natural History of Molluscan Feeding convened by Hans Bertsch, and Invertebrate DNA: Prospects and Problems convened by Michael Hellberg. Contributed papers and poster presentations are also solicited.

In addition to the scientific program there will be many other events. The San Diego Shell Club will host a welcoming wine and cheese reception. There will be field trips (Hubbs-Sea World Research Institute, paleontology sites in San Diego County, and the Stephen Birch Aquarium), an auction and book/reprint sale to support student grants, evening slide shows, shell displays and a banquet.

Deadline for receipt of titles of talks or poster presentations is May 1. Deadline for abstracts is June 1. For further information, contact President Hugh Bradner (619) 459-7681; FAX (619) 459-0657 or e-mail: hbradner@ucsd.edu.

The Auction/Potluck '96

The Club's annual auction/potluck is always a fantastic affair. Help make this year's as great as always by remembering to make your donation. Contact a board member and arrange for pickup if you will not be able to bring your donation to the March meeting.

Two highlights of the auction will be a magnificent specimen of the white form of *Cypraea jeania* (*aurata*) and Oldroyd's original *The Marine Shells of the West Coast of North America* (all four parts).

POLINICES (MAMMILLA) SIMIAE ON ISLA DEL COCO, COSTA RICA: ANOTHER INDO-PACIFIC INVADER INTO THE PANAMIC PROVINCE

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During the April 1992 expedition to Isla del Coco, Costa Rica (see Chaney, 1992), three live specimens of a naticid species were collected by Kim Hutsell from sand trails in 15-20 m in Bahía Wafer. Initially these specimens were tentatively identified as *Polinices (Mammilla) caprae* (Philippi, 1850). This determination came more or less by default as *P. caprae* is the only valid species of *Mammilla* which has been reported from the Panamic Province (Keen, 1971; Marincovich, 1977; Skoglund, 1992). Two other taxa, *Polinices crickmayi* Palmer & Hertlein, 1936, and *Polinices (Mammilla) clarki* M. Smith, 1950, are regarded as junior synonyms of *P. (M.) caprae* (Marincovich, 1977).

On close inspection of the three specimens from Isla del Coco it became clear to me that they were quite different from typical *P. (M.) caprae* in a number of features. When I compared them to Indo-Pacific species of the subgenus *Mammilla* I concluded that all three specimens belong to the widely distributed Indo-Pacific species *Polinices (Mammilla) simiae* (Deshayes, in Deshayes & Edwards, 1838) (see Table 1 and Figures 1,3,5). This species extends from South Africa to Hawaii and from New Zealand to Japan. To my knowledge it has not previously been found in the eastern Pacific.

Although *P. (M.) caprae* and *P. (M.) simiae* are very similar in their general shape and color pattern, there are several morphological features that serve to easily and reliably tell them apart. I have not yet encountered any specimens which could not unequivocally be assigned to one of the two species. Table 1 lists the various features useful for differential diagnosis.

As *P. (M.) simiae* (Figures 1,3,5) is, at least superficially, quite similar to *P. (M.) caprae* (Figures 2,4), it seemed possible that additional specimens of *P. (M.) simiae* might have been collected over the years in the Panamic Province that were misidentified as *P. (M.)*

caprae. In an attempt to locate such specimens, I examined naticids collected by Donald Shasky now in the collections of the Santa Barbara Museum of Natural History. The Shasky collection from Isla del Coco contains two lots of shells labeled "*P. (M.) caprae*". The first lot (SBMNH 142079) was collected at Bahía Chatham on sand at night in 20-25 m, 21 March 1989, and consists of one live taken specimen with the operculum retained attached to the dried animal. The second lot (SBMNH 142080) was collected on Isla Manuelita, on sand at night in 17 m, 24 April 1986, and consists of three live taken specimens. All four specimens are clearly *P. (M.) simiae*, and are indistinguishable from the those collected by Kim Hutsell in 1992.

The collections of the Los Angeles County Museum of Natural History were also checked for possible specimens of *P. (M.) simiae*. Indeed, there is one lot (LACM 38-38.11) consisting of a single dead specimen of 15.0 mm collected off Isla Nuñez, Isla del Coco, at 55-91 m on rocky and coralline substrate by the Allan Hancock Foundation Expedition, working off the R/V *Velero III* in January 1938.

It is, thus, obvious that *P. (M.) simiae* (Figure 5) has been living on Isla del Coco for at least 60 years. I have not seen any true *P. (M.) caprae* from Isla del Coco. Therefore, it is not clear at present whether the two species coexist on this island, or anywhere else for that matter. It should be noted here that *P. (M.) caprae* appears to prefer somewhat deeper water (> 30 m) than the largely intertidal *P. (M.) simiae*, so that their ecological niches are not necessarily congruent.

Since *P. (M.) simiae* managed to spread to Isla del Coco, one might expect this species to have migrated to the other eastern Pacific oceanic islands as well. However, at present there is no evidence for the occurrence of *P. (M.) simiae* on Isla Guadalupe, Islas Revillagigedo, Clipperton Island, or the Galápagos. A possible explanation could be that Isla del Coco lies in

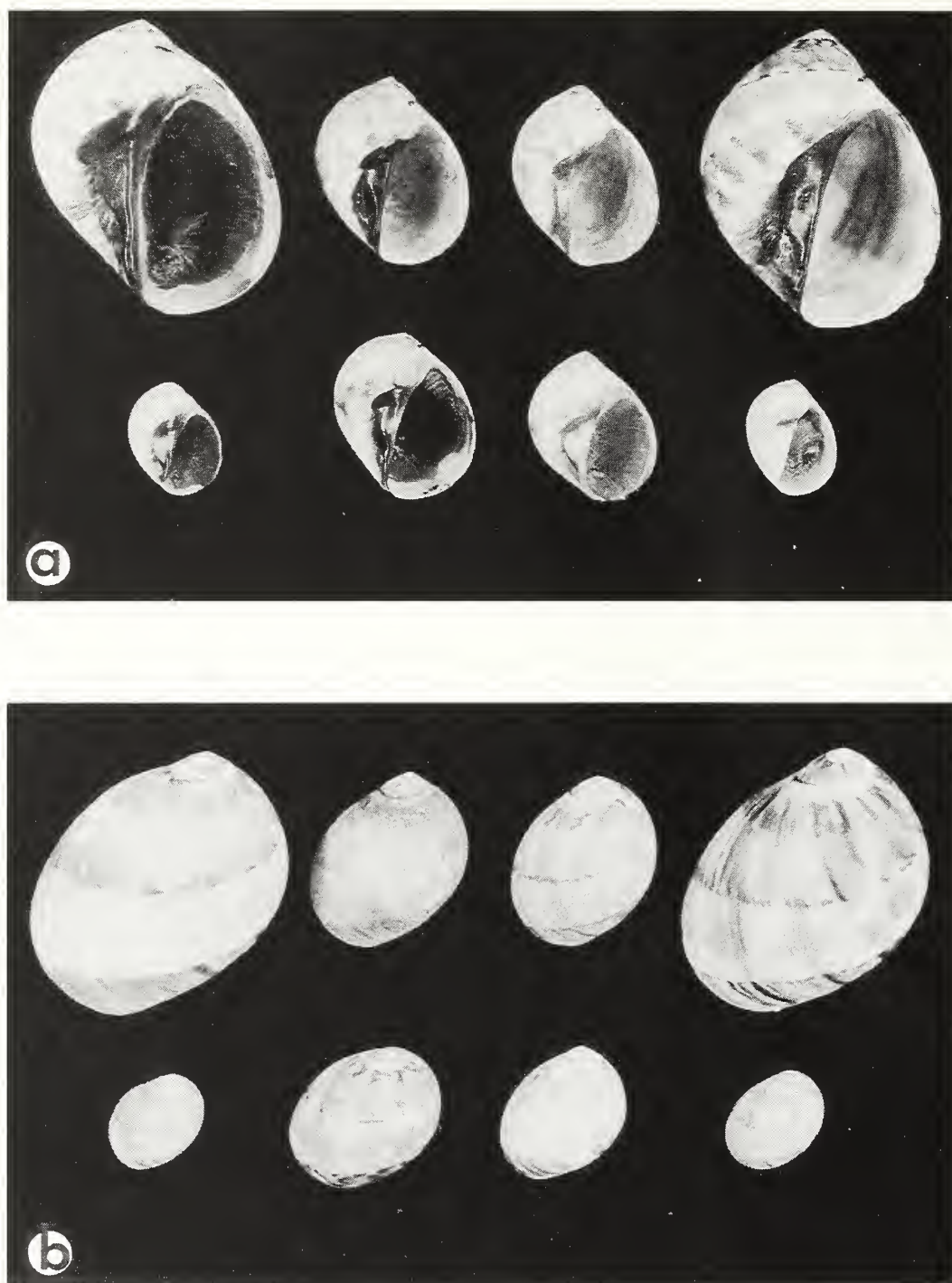


Figure 1. *Polinices (Mammilla) simiae* (Deshayes, in Deshayes & Edwards, 1838). Apertural views (a) and dorsal views (b) of 8 specimens (A to H, from left to right, top row first) from various locations throughout the Indo-Pacific region. A: Hidoka, Japan, MHC 940418.39; B: Jeffrey's Bay, Cape, South Africa, washed ashore after rough seas, MHC 940418.23; C: New Zealand, MHC 940418.26; D: Phe-Phe Island, Phuket, Thailand, at 20 m among coral rubble, MHC 940418.40; E: off Agat, Guam, MHC 940418.38; F: Julear, Madagascar, intertidally, MHC 940418.30; G: Dampier Archipelago, Western Australia, on intertidal sand flats, MHC 940418.33; H: Topatii, Huahine, French Polynesia, at -0.8 m in coarse white sand pockets near reef, MHC 940418.35. Note dark brown operculum of specimens A and E-H. The small divisions on the scale shown on the right represent millimeters.



Figure 2. *Polinices (Mammilla) caprae* (Philippi, 1850). Apertural views (a) and dorsal views (b) of 10 specimens (A to J, from left to right, top row first) from various locations in the Panamic Province. A-D: Junta de Jualuapan, Manzanillo, Colima, Mexico, 30 m, leg. Carl & Laura Shy; E-F: Playas del Coco, Guanacaste, Costa Rica, dredged at 30-35 m on mud bottom; G-I: Islas Perlas, Panamá; J: Bahía Escondido, B.C., Mexico, on sand and rubble at 30 m, leg. Kim Hutsell; A: MHC 940418.3, B: MHC 940418.5, C: MHC 940418.7, D: MHC 940418.8, E: MHC 940418.9, F: MHC 940418.11, G: MHC 940418.21, H: MHC 940418.19, I: MHC 940418.13, J: MHC 940418.12. Note light brown operculum of specimens B and C. The small divisions on the scale shown on the right represent millimeters.

the path of the eastbound north equatorial countercurrent while the other oceanic islands do not.

Interestingly, Hertlein & Strong (1955) reported the Panamic mainland species *P. (M.) caprae* from the Galápagos at Isla Isabela (Albemarle Island) (1 specimen, in CAS collection), while Marinovich (1977) figured a specimen of a true *P. (M.) caprae* from Isla Santa Cruz (AMNH 110382). No reports are available of *P. (M.) caprae* from Isla Guadalupe, Islas Revillagigedo, or Clipperton Island. The presence of *P. (M.) caprae* on the Galápagos may suggest that *P. (M.) caprae* could also occur at Isla del Coco.

P. (M.) simiae to my knowledge has not been reported from the west American mainland. Thus, it appears that Isla del Coco is the easternmost limit in the distribution of *P. (M.) simiae*. William K. Emerson, who reviewed the distribution of shallow water Indo-Pacific species in eastern Pacific waters (Emerson, 1991), did not list any species of the family Naticidae. Thus, the range extension for *P. (M.) simiae* reported in this paper is the first report of an Indo-Pacific naticid occurring in the eastern Pacific.

Abbreviations used:

AMNH = American Museum of Natural History
CAS = California Academy of Sciences
LACM = Los Angeles County Museum of Natural History
MHC = Michael Hollmann collection
SBMNH = Santa Barbara Museum of Natural History

Note to readers:

The author is very much interested in hearing of any other findings of *P. (M.) simiae* (or any other Indo-Pacific Naticidae) in the Panamic Province, particularly from the mainland.

ACKNOWLEDGMENTS

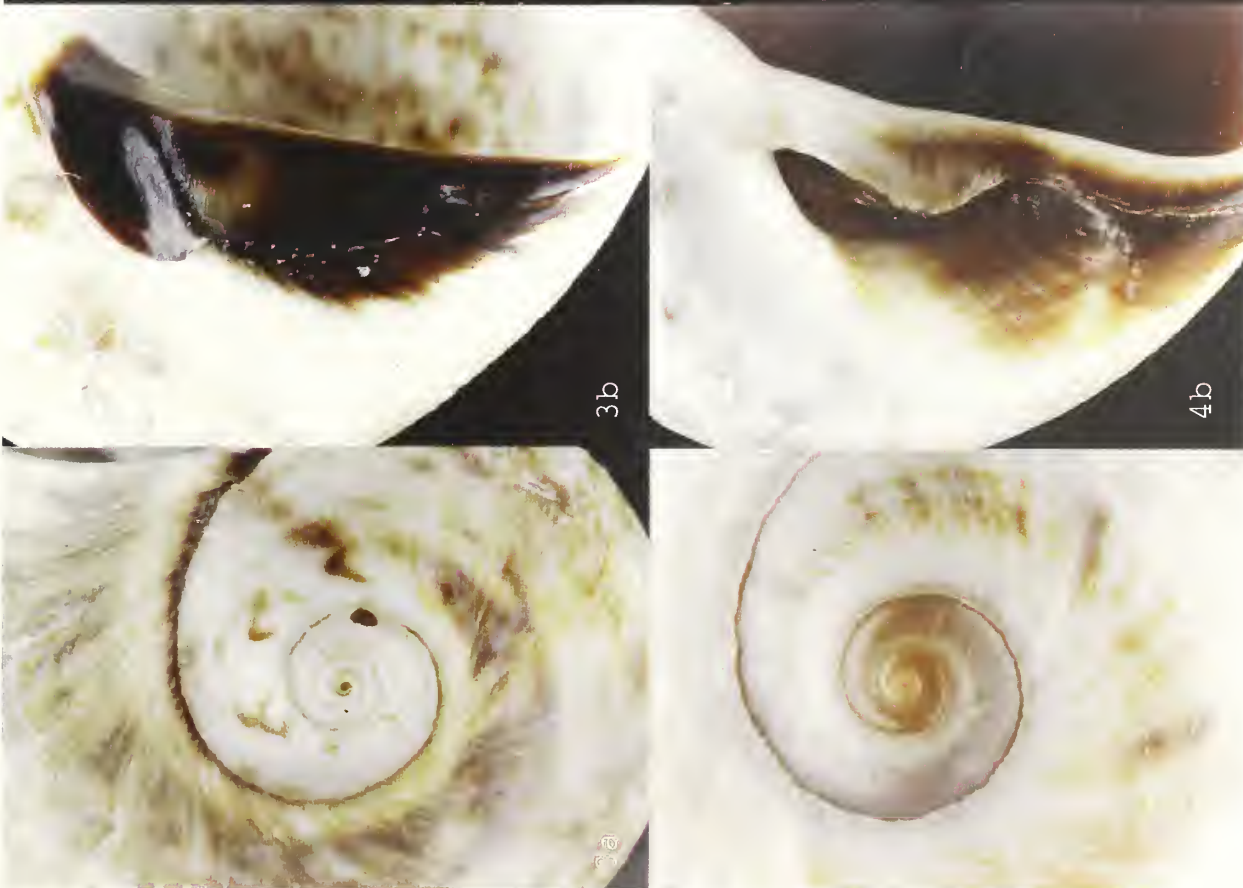
My thanks go to Kim Hutsell who spotted and collected the three *P. simiae*, and, with his usual diligence, kept all the relevant data. I also would like to thank Donald

Shasky, George Kennedy of the Department of Geological Sciences at San Diego State University and Paul Scott of the Santa Barbara Museum of Natural History for arranging access to specimens of *P. simiae* from Isla del Coco collections, and James McLean and Lindsey Groves of the Los Angeles County Museum of Natural History for access to the LACM collection. Finally, my thanks go to Carole Hertz for her much appreciated help in locating the scattered literature on Indo-Pacific species in eastern Pacific waters.

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Figures 3-5. (3) *Polinices (Mammilla) simiae*. Close-up of the apex (a) and the columella (b). Same specimen as in Fig. 1B. In a, note dark nuclear whorls and black line at suture; in b, note tongue-shaped lower lobe of parietal callus, broadly reflected columellar callus with indistinct white fleck, and narrow brown band running into the umbilicus. (4) *Polinices (Mammilla) caprae*. Close-up of apex (a) and columella (b). Same specimen as in Fig. 2G. In a, note white nuclear whorls and absence of black line at suture; in b, note inconspicuous lower lobe of parietal callus, narrowly reflected columellar callus with protrusion in the middle (funicular callus, with oblique transverse groove), and broad brown band running into the umbilicus. (5) *Polinices (Mammilla) simiae*. Apertural view (a) and dorsal view (b) of two specimens from Bahía Wafer, Isla del Coco, Costa Rica, hand-dredged from sand at 15-20 m, leg. Kim Hutsell, currently held in MHC, 940513.2 (left specimen) and 940513.1 (right specimen); c: apical view of the right specimen in a and b. The small divisions on the scale shown on the right represent millimeters.



Raspe, Nürnberg. *Natica caprae*, pl. 9, fig. 2 (1850), text p. 56 (1852).
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TABLE 1. Diagnostic features for *P. (M.) simiae* & *P. (M.) caprae*

Feature	<i>P. (M.) simiae</i> (Deshayes, in Deshayes & Edwards, 1838)	<i>P. (M.) caprae</i> (Philippi, 1850)
Protoconch	brown to black	white
Suture	bordered by a thin blackish line, particularly on last whorl	no blackish line below suture
Parietal callus	prominent, tongue-shaped, brown, usually protruding to the left side of the columella, well beyond the umbilical callus	inconspicuous, white, not protruding beyond umbilical callus
Columellar callus	well developed along entire length of the columella, tapering anteriorly; broadly reflected to cover the umbilicus, sometimes button-shaped and entirely filling the umbilicus, occasionally leaving a slit-like opening; brown with a very distinct white fleck in the center (in some specimens, white fleck may be quite small)	developed only at the posterior half of the columella; narrowly reflected, always leaving a half-open umbilicus; with a nose-like protrusion to the left in the middle of the columella; this protrusion represents the funicular callus and always shows an oblique horizontal groove; columella brown below the nose-like protrusion, while callus above is white
Umbilicus	closed or slit-like, with a narrow brown band running into the umbilicus from the base; brown band may be bordered by a second brownish band which is distinctly lighter in color; brown band may be absent in juveniles	half open, with a broad brown band running from the base into the umbilicus; brown band may be absent in juveniles
Aperture	always white inside, with outside color pattern shining through	brown inside (except for juveniles), with outside color pattern weakly shining through
Operculum (horny)	deep reddish-brown	light brown, honey-colored

PANAMIC PUZZLES: VALID OR VARIANT VITRINELLIDS?

ROBERT KOCH

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA¹

The genus *Episcynia*, in the family Vitrinellidae, exhibits a unique feature; the periphery of the whorl has a slender keel or carina, often minutely serrate, above and below which is attached a tuft-like periostracal fringe. This fringe apparently sheds easily as it is present on only a few of the specimens in the Koch and Skoglund collections. Three *Episcynia* species have been reported from the Panamic Province (Keen, 1971), one of which was later synonymized (Myers, Hertz & Gemmell, 1990).

In the Koch (K) and Skoglund (S) collections are a limited number of Vitrinellidae which cannot be referred to any described species within the Panamic Province. They have a disjunct final whorl which is detached from the preceding turn. All were recovered dead, from dredged grunge.

When examined from the apertural view, there are two distinct species. "Species 1" has a more elevated spire, while "species 2" exhibits a larger and broader aperture. However, the dorsal and basal views do not show this difference and the two could be considered a single species.

Photos (apertural and basal views only) were sent to Dr. Winston Ponder and Dr. Anders Warén. Dr. Warén's "guess" [dated 7/29/94] was *Episcynia* since "They do have a periostracal keel like that genus and a sharply demarcated umbilicus.." He asked, "...is the protoconch yellow?...[if so] it is in *Episcynia*." This latter feature is indeterminate in these dead shells. Dr. Ponder's response was, "The beast you have is almost certainly an *Episcynia* - I think I may have seen a specimen before with a similar disjunct body whorl but cannot recall where."

The three lots of "Species 1" have diameters of 1.0-1.5 mm. Distribution is from off Bahía

Concepción, Baja California Sur (1 specimen, S) (Figures 1,2) to Estero Morua, Puerto Peñasco, Sonora, Mexico (1 specimen, K) and south at Bahía de Panamá, Panamá (3 specimens, K). Only the Bahía Concepción specimen displays the peculiar peripheral tufted fringe. The other four have but a very faint trace of a modest ridge with no visible serrations.

"Species 2" (Figures 3,4) is represented by a single lot of two specimens with diameters of ca 1.6 and 1.8 mm. These are from off Punta Arco, Guaymas, Sonora, Mexico in depths of 30 to 40 m (S) and, again, evidence only a vague peripheral ridge with no serrations.

The only questionable aspect that I can discern involves the peripheral sculpture of all the "naked" shells. While not readily apparent from the dorsal or basal views, all evidence a vague peripheral ridge that shows no serrations. Being dredged dead, could this lack of a distinctive *Episcynia* characteristic simply be the result of wear and/or erosion?

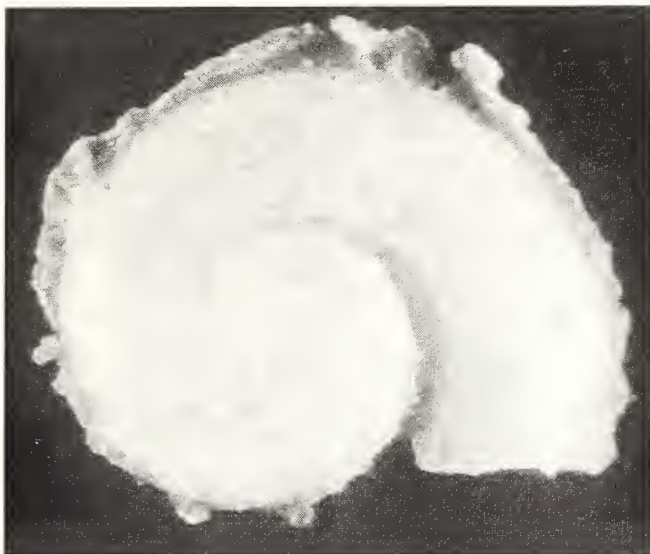
Whatever these tiny rascals represent -- aberrants or true species -- they seem, at least for the time being, best placed within the genus *Episcynia*.

Thanks to David K. Mulliner for the excellent photographs, to Drs. Winston Ponder and Anders Warén for their informative comments and to Carol Skoglund for the loaned specimens.

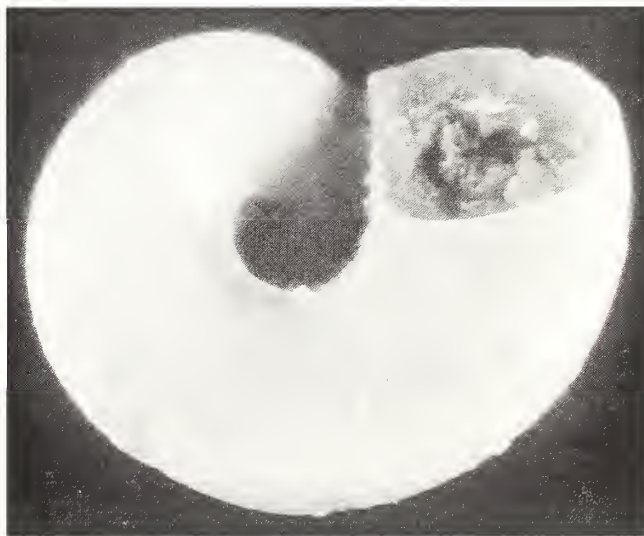
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¹Mailing address: 1215 West Seldon Lane, Phoenix, AZ 85021



Figures 1 and 2. *Episcynia* "Species 1", dorsal and basal views of 1.5 mm diameter specimen from Bahía Concepción, Baja California Sur, Mexico. Skoglund Collection. Photos: D. K. Mulliner.



Figures 3 and 4. *Episcynia* "Species 2", dorsal and basal views of 1.8 mm diameter specimen from Punta Arcos, Guaymas, Sonora, Mexico. Skoglund Collection. Photos: D. K. Mulliner.

THE FESTIVUS ANNOUNCES A COMPREHENSIVE INDEX 1970 THROUGH 1995

Carole M. and Jules Hertz have compiled an index of the articles and papers which have appeared in *The Festivus* since its inception in 1970. The index of 31 pages is arranged both by author and by key words. The author index is arranged alphabetically by author's last name; each entry including (in chronological order) year, title, volume, issue, pages and number of figures. The key word index is arranged alphabetically, each key word followed by entries in alphabetical order by author's last name, volume and issue.

This comprehensive index [Vol. I, no. 1 through Vol. XXVII, no. 11] is available for \$5.00 (domestic addresses) and \$6.00 (overseas, surface mail). To order, send your check, made payable to the San Diego Shell Club, to the Club address at 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA.

For those individuals and institutions utilizing the database *Procite*, disks of the index can be ordered for \$15.00 including postage. Add one dollar for overseas orders.

TWO NEWS ITEMS OF INTEREST TO DIVERS

The San Diego Union-Tribune of 21 February 1996 disclosed an electronic device to repel sharks. The "Shark-off" device was developed by a South African inventor and works by creating an electric field generated by the two-part device which is attached to a diver's air tank and flipper. The device, tested by Valerie and Ron Taylor provided a safe zone of up to seven yards -- both for the diver and the shark. The device is due to become commercially available in May.

An article in the December 1994 issue of *Levantina*, published by the Israel Malacological Society [no. 81:8], by B. S. Singer & D. Korkos reported on a danger among corals in the Gulf of

Aqaba. They told of a physically fit, fully suited diver who entered a shallow cave to collect sand from the cave floor and received a burning shock to his face lasting two to three seconds which stunned him. It took about 20 seconds before he no longer felt in danger.

The authors surmise that the corals, although not touched by the diver, may have secreted a venom into the water when disturbed by the diver's entry into the cave. There were no marks from nematocytes on the diver. The article advises divers swimming close to their reefs to wear full suits, even in warm water. They added that this occurrence may explain some previous unresolved diving fatalities in the area.

PACIFIC SHELL CLUB'S THIRD SEA SHELL SHOW

The Pacific Shell Club presents their 3rd Sea Shell Show on Sunday, 28 April 1996 from 10:30 a.m. to 5:00 p.m. at the Cabrillo Marine Community Building,

Berth 28, San Pedro, California. There will also be an auction from 3-4:30 p.m. All are invited to exhibit and attend. For additional information call (310) 514-8012.

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THE FESTIVUS

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

COME TO THE AUCTION/POTLUCK !

20 April 1996, 5:00 p.m. - ?

Summer Hill Clubhouse, 3575 Ruffin Rd., San Diego

(See map on last page for details.)

There will be no regular meeting this month.

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CLUB NEWS

Additions to the Roster

AVILEZ, DON & KIM, 5481 Los Robles, Carlsbad, CA 92008, (619) 438-4460.
PASQUA ROBERT A., 2236 Via Chalupa, San Clemente, CA 92673, (714) 492-6855.
PONDER, WINSTON F., Australian Museum, 6-8 College St., Sydney, N.S.W. 2000, Australia.
SMITHSONIAN INSTITUTION LIBRARIES, Library Acquisitions Acct. #9010520201, Washington, D.C. 20560.

From the Minutes of the Meeting of the San Diego Shell Club, 21 March 1996

Bill Romer called the meeting to order at 7:45 p.m. The minutes of the February meeting were approved as published in the March issue of *The Festivus*. Margaret Mulliner reported as treasurer that the Club is financially sound. As librarian, she told members that the Club library now has the new *Manual of the Living Conidae, Volume I. Indo Pacific Region*.

Bill read a letter from members Rosemary and Frank Pierce in Temecula inviting members to their home. Bill also thanked Kent Trego for volunteering to serve as host. The volunteer list and the refreshment sign-up sheet were passed around to the membership.

A potluck sign-up sheet was passed for the Auction/Potluck on April 20th. The auction will start one hour earlier (at 5 p.m.) so that it does not go late into the night. Donations are still needed.

The Bizarre Bazaar will be held some Sunday in August. The specifics will be announced soon. The September Party will be held at the Arnold's. The theme and the date are yet to be determined.

Larry Buck asked the Club to renew the magazine *World Shells* on an on-going basis. Librarian Margaret Mulliner suggested that the Board should consider this matter.

On behalf of the WSM, president Hugh Bradner expressed his deep appreciation for the generous student grant donation made by the Club.

Terry Arnold introduced the speaker of the evening.

Sally Shelton spoke on a subject that is near and dear to us all and she is a specialist on collection preservation. Sally began her presentation by informing us that Byne's Disease is, in fact, not a disease. She said that Thomas Brown was the first to observe the white spotting and deterioration of shells. Byne claimed that the cause was bacterial but Agnes Kenyon disagreed. It was not until 1985 that a definitive paper was written on the subject. Sally continued her talk by advising preventive measures such as storage in steel cabinets, using acid-free paper and avoiding cotton, cork and PVC plastics. [A future issue of *The Festivus* will publish excerpts from Ms Shelton's talk.]

The drawing winner was Paula Barton. Thank you to the Bradners and the Hertzes for the delicious refreshments. The meeting was adjourned at 9:15 p.m. for everyone to enjoy the refreshments, the casual conversation and the many shells for viewing, especially some great *Latiaxis*.

Silvana Vollero

The Auction/Potluck '96

The Auction/Potluck, the Club event of the year, will be held on Saturday evening, 20 April again at Wes Farmer's Clubhouse (see map, last page). The festivities will begin at 5:00 p.m. with "Dave's punch" and shell viewing. Dinner will begin at 6:00 p.m. and the auction will start promptly at 7:00 p.m.

If you have not signed up for your potluck contribution or made your shell donation, it's not too late. Contact any board member and arrange for pickup of your donation and/or let them know what food contribution you will make.

The auction is not only a great party, but it is the Club's only fundraising event. Your donations and purchases provide the means by which the Club's publication, *The Festivus*, continues to operate and publish occasional supplements, allows the library to buy books which are too costly for many home libraries and provides for donations for scientific grants and student scholarships. So help the Club and have a whale of a good time. See you at the Auction!

DISTRIBUTIONAL RECORDS OF INTERESTING AND RARELY COLLECTED MARINE GASTROPODS FROM THE TROPICAL EASTERN PACIFIC

DONALD R. SHASKY

4990 Nighthawk Way, Oceanside, CA 92056, USA

For a number of years **The Festivus** has published, on a continuing basis, information on range extensions and data about species not previously recorded in the tropical eastern Pacific fauna. By far the largest project of this type undertaken is the series of four "updates" to Keen (1971) by Carol Skoglund (1989, 1991a,b, 1992). This paper reports on 61 species in 42 genera and 18 families. With three exceptions, all specimens listed are in my collection.

The species are arranged in taxonomic order according to Skoglund (1991b, 1992) with numbers from Keen (1971) included, when applicable.

TURBINIDAE

149. *Turbo squamiger* (Reeve, 1843). New record from Isla del Coco, Costa Rica. Four specimens were dredged in 15-61 m, during two trips, 5 March 1984 and May 1985. This, I believe, is also a new depth record.

SKENEIDAE

124. *Parviturbo stearnsii* (Dall, 1918). New record from Isla del Coco. Twenty specimens were collected by diving in 18-34 m, during March 1984 and March 1985; nine specimens were dredged in 61 m off the west end of the island, 5 March 1984, and one specimen was taken in a tangle net in 107-122 m, a depth record, off the northwest side of the island, April 1992.

PELYCIDIIDAE

220. *Pelycidion kelseyi* (Bartsch, 1911). Additional distribution records. This species was described as a *Nodulus* from a single specimen from Coronado Island, San Diego, California. It was placed in the genus *Pelycidion* Fischer, 1873, by Ponder and Hall (1983) when they created the family Pelyciidiidae, which, at the

time, they placed in the order Archaeogastropoda. Keen (1971) reported this species as far south as Nayarit, Mexico, and Draper (1974) reported it from the Galápagos. I collected five specimens at Isla del Coco, Costa Rica, in 20-38 m, 13-16 February 1991 (Figure 1) and two specimens intertidally at Isla Venado, Panamá, in March 1971.



Figure 1. *Pelycidion kelseyi* (Bartsch, 1911), 1.5 x 0.4 mm. Isla del Coco, Costa Rica in 28-38 m. Photo: D. K. Mulliner.

199. *Alvinia halia* (Bartsch, 1911). A range extension to Panamá. This species was described as an *Alvania* from specimens dredged in 80 m on a sand and shell bottom in the Islas Galápagos by the Albatross. Ponder (1985) placed this species in *Manzonina* and J. Hertz (1994) transferred it to *Alvinia*. K.L. Kaiser collected additional specimens off Isla Santa María (*Floreana*) and Isla Santa Cruz (*Indefatigable*) in the Galápagos in 9 to 12 m (J. Hertz, 1994), and I found six specimens intertidally on rocks just west of Punta Cormorant, Isla Santa María (*Floreana*) on 15 February 1988. On 13 April 1992, I found ten specimens of *A. halia* under rocks and coral at Isla Landones, Golfo de Chiriquí, Panamá, at a depth of 12 to 15 m (Figure 2).



Figure 2. *Alvinia halia* (Bartsch, 1911), 2.0 mm. Isla Landones, Panamá in 12-15 m. Photo: D. K. Mulliner.

RISSOIDAE

216. *Lapsigyrus myriosirissa* Shasky, 1970. A range extension to Panamá. This species was described from Mazatlán, Sinaloa, Mexico, where it was dredged in a mud bottom at 20 m. Chuck Snell collected two specimens at a depth of 7 m off Sayulita, Nayarit,

Mexico, in April 1971, and I found a specimen at Isla Jesusita, Golfo de Nicoya, Costa Rica, in 1 to 3 m in siftings on 26 November 1978 and dredged two very worn specimens off Punta Chame, Panamá, in August 1986.

246. *Rissoina burragei* Bartsch, 1915. New record from Isla del Coco. This species was known only from the Golfo de California. I collected four lots totaling 10 specimens from four dive sites at Isla del Coco, in 10 to 32 m on 13-16 February 1991, 19 April 1993 and 3-18 March 1984.

250. *Rissoina effusa* Mörch, 1860. New record from Isla del Coco. Described from Panamá and known from as far south as Salango and Isla La Plata, Ecuador. This species has been found at numerous dive sites at Isla del Coco, Costa Rica, in 9-33 m during April 1983, March 1984, May 1985, May 1986 and April 1987 for a total of 89 specimens.

268. *Rissoina peninsularis* Bartsch, 1915. A range extension. Reported only from the Golfo de California, I have collected this species from the following six locations. Mexico: one specimen intertidally, under a rock, from the east side of Isla Chivos, Mazatlán, Sinaloa, 26 December 1962; two specimens from Coatecomate, Jalisco, in siftings from 8-15 m, 12-20 October 1968; two specimens trawled in 15-30 m off Chiapas, between Puerto Madero and San Simeon during January to August 1961. Panamá: one intertidal specimen from Isla Venado, 8-11 March 1970. Ecuador: one specimen from Punta Mala, Manabí, under a rock in 20 m, 18 September 1978; and six specimens from under rocks and coral in 6-12 m from Isla Salango, Manabí, 26 June to 4 July 1980.

Previously I misidentified the above two lots from Ecuador as *Rissoina zeltneri* (de Folin, 1867.) For those of you who have that paper (Shasky, 1983), please make this correction.

271. *Rissoina stricta* Menke, 1850. Additional distribution records. Known from Mazatlán, Sinaloa, Mexico, to the Islas Galápagos. I have collected this species from the following locations. Mexico: six specimens from under intertidal rocks at La Libertad, Sonora, 24-25 May 1967; four specimens in 1-3 m under rocks at El Pulmo Reef, Baja California Sur, 11 April 1965; 15 specimens under rocks in 1.5-6 m at Bahía Braidwaite, Isla Socorro, Islas Revillagigedo; 12

specimens under rocks, intertidally, one mile south of Puerto Ballota, Isla María Madre, Islas Tres Marias, 22 December 1964. Costa Rica: 25 specimens under coral in 9-24 m at two dive sites at Isla del Coco, 15-20 April 1983.

279. *Rissoina zeltneri* (de Folin, 1867). Originally described from Mazatlán, Sinaloa, Mexico. As noted above, in my earlier paper (Shasky, 1983) I misidentified two lots of *R. peninsularis* as *R. zeltneri*. The third lot from Isla La Plata was correctly identified as *R. zeltneri*.

242. *Zebina axeliana* (Hertlein & Strong, 1951). Additional collection record. Described from off Puerto Guatulco, Mexico, dredged in 12.6 m on a bottom of grey sand and crushed shell. It has been reported from Guaymas, Sonora, Mexico (Skoglund & Koch, 1995), the Galápagos (J. Hertz, 1976) and from Manabí Province, Ecuador (Shasky, 1983). On 15 March 1984, I found three specimens in 13 to 17 m under rocks at Bahía Ballena, Golfo de Nicoya, Costa Rica.

281. *Zebina* (*Tiphyocerma*) *preposterum* (Berry, 1958) (Figure 3a-c). Additional collection record. This species was described from a single decollate specimen from Puerto Peñasco, Sonora, Mexico. The type, illustrated by Keen (1971), exhibits minimal detail. The type was subsequently illustrated by C. Hertz (1984) showing more sculptural detail.

Ponder (1985) transferred *Tiphyocerma* to a subgenus of *Zebina*. He illustrated two specimens from the collection of the Los Angeles County Museum. One was collected between Rancho el Tule and Rancho Palmilla, Baja California Sur, Mexico, in 18 to 36 m. The other, a 2.3 mm specimen, was taken in 2 to 17 m on a rock substrate from the head of the Golfo de Dulce, northwest of Rincon de Oro, Punta Arenas Province, Costa Rica, on 19 March, 1972 by James H. McLean. Another specimen (2.3 mm) collected in the northern Golfo de California by Bert Draper was found at Estero Morua, Sonora, Mexico (7 miles southeast of Puerto Peñasco), in October 1973. I found a fifth specimen (2.5 mm) in 13 m in siftings, about 0.5 km northwest of Bahía Saladita near Guaymas, Sonora, Mexico, in August 1970.

BARLEEIDAE

225. *Barleeia polychroma* (de Folin, 1870). A range extension. Described from Panamá, I am not aware of any other citation of ranges for this taxon. I collected

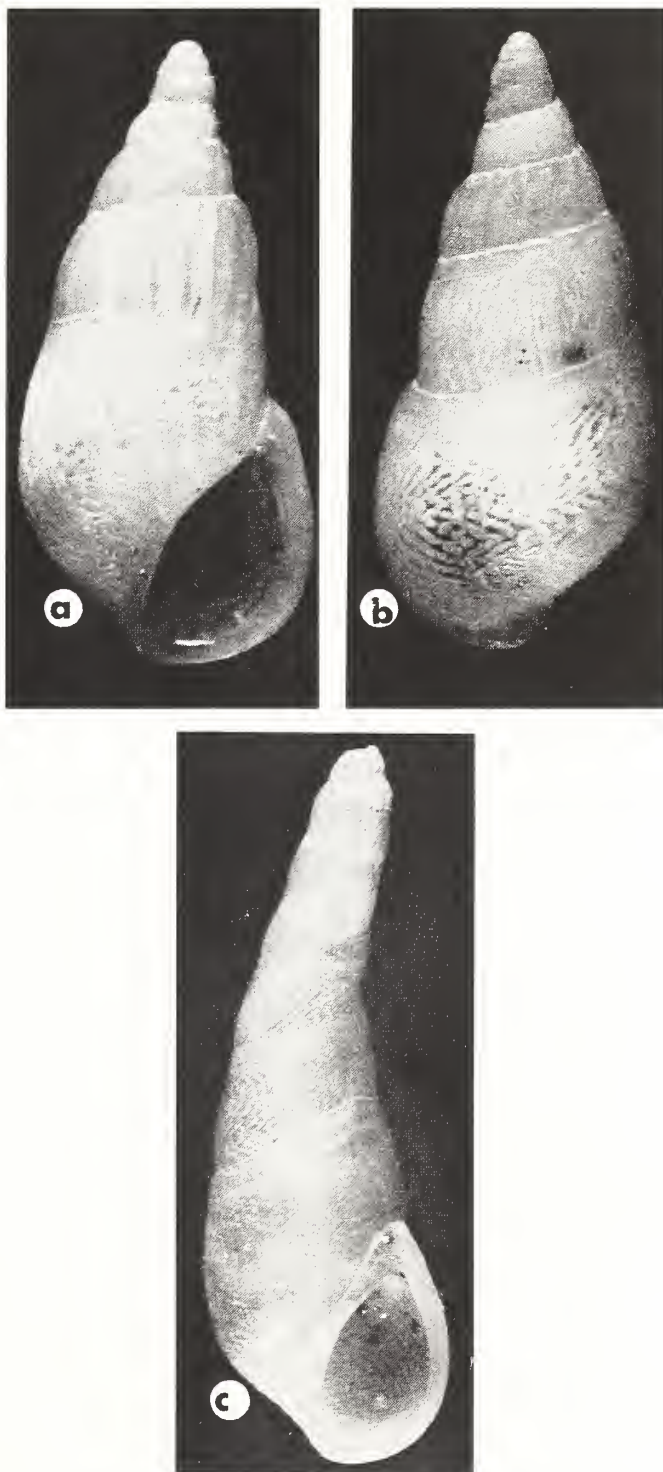


Figure 3a-c. *Zebina* (*Tiphyocerma*) *preposterum* (Berry, 1958). (a&b) 2.3 mm L, Estero Morua, Sonora Mexico, leg. B. Draper, November 1975. (c) 2.2 mm L, Golfo Dulce, Puntarenas Province, Costa Rica, leg. J. McLean, March 1972 (LACM 72-71). Photos: B. Draper.

one lot of 20 specimens in 15-21 m under rocks off the SE tip of Isla San Pedro Nolasco, Golfo de California, Mexico, on 13 October 1981. I also found 26 specimens on 15 April 1983 from three dive sites at Isla del Coco, in depths of 6-24 m under coral. Another lot of an estimated 200 specimens was taken intertidally under rocks at Bahía Chatham on 21, 25 May 1985. During February 1991 more than 100 specimens were collected from tangle nets from coralline algae in 79-82 m.

226. *Barleeia paupercula* (C.B. Adams, 1852). New record from Isla del Coco. Described from Panamá, this species has been reported from near Santa Rosalia, Baja California Sur, Mexico (Draper, 1972). From Isla del Coco, I have one lot of 305 specimens taken on coral at Roca Sucia, at a depth of 18-36 m in March 1984 and a second lot of eight specimens taken under rocks intertidally at Bahía Chatham, 21 May 1985.

ELACHISINIDAE

236. *Elachisina johnstoni* (Baker, Hanna & Strong, 1930). Additional collection record. Described from Cabo San Lucas, Baja California Sur, Mexico, I reported this species from the Galápagos (Shasky, 1989). I have collected specimens from several localities in the Golfo de California, Isla Venado, Panamá, and Punta Ancón, Ecuador. In addition I have collected four specimens from Isla del Coco, Costa Rica: one specimen in 18-33 m under coral, March 1984, two specimens dredged in 46-68 m, 27 May 1985 and one specimen in 91-122 m on 9 May 1986.

TRUNCATELLIDAE

283. *Truncatella bairdiana* C.B. Adams, 1852. A new record from Isla del Coco. As far as I am able to tell, this species is known only from the type lot of 400 specimens collected under a heap of stones at the high-water mark "at the bottom of the sea wall of Panama."

Clench & Turner (1948) in their monograph of the western Atlantic *Truncatella* synonymized *T. bairdiana* and three other species into *T. bilabiata* Pfeiffer, 1840. Turner (1956) seemed to confirm the validity of *T. bairdiana* in a footnote in her paper on the species of the eastern Pacific described by C.B. Adams. Although I have collected in Panamá many times, including along the sea wall in Ciudad de Panamá adjacent to the Panama Canal, I have failed to find this species. On the northwest side of Isla del Coco, a small river empties into Bahía Wafer. Along the southern bank of the river, I collected eight specimens of *T. bairdiana*

under a rotting log in the spring of 1985.

TRIVIIDAE

911. *Erato oligostata* Dall, 1902. Additional distributional record. The northern limit for this species is recorded as Panamá, the type locality. I have collected two lots at Bahía Ballena, Golfo de Nicoya, Costa Rica; the first lot from under a rock in 13-14 m and the second dredged in 13-17 m on 14-16 March 1984.

RANELLIDAE

--- *Linatella succincta* (Linnaeus, 1771). A new record from Isla del Coco. This Indo-Pacific species, was previously reported by me from a single specimen from Isla Enderby off Isla Santa María (*Floreana*), Galápagos, in 1988 (Shasky, 1988). This new record is a single juvenile specimen collected by me under a coral slab in 13 m at Bahía Weston, Isla del Coco, on 13 April 1983 (Figure 4).



Figure 4. *Linatella succincta* (Linnaeus, 1771), 10.5 x 6.3 mm, Bahía Weston, Isla del Coco, in 13 m. Photo: D. K. Mulliner.

MURICIDAE

977. *Haustellum lividus* (Carpenter, 1857). A range extension. This species was described from Mazatlán, Sinaloa, Mexico, which is still its known southern range. It is also known in the Golfo de California. Neither Carpenter (1857), Keen (1971), Vokes (1988) nor Fair (1976) gave any indication as to its habitat and

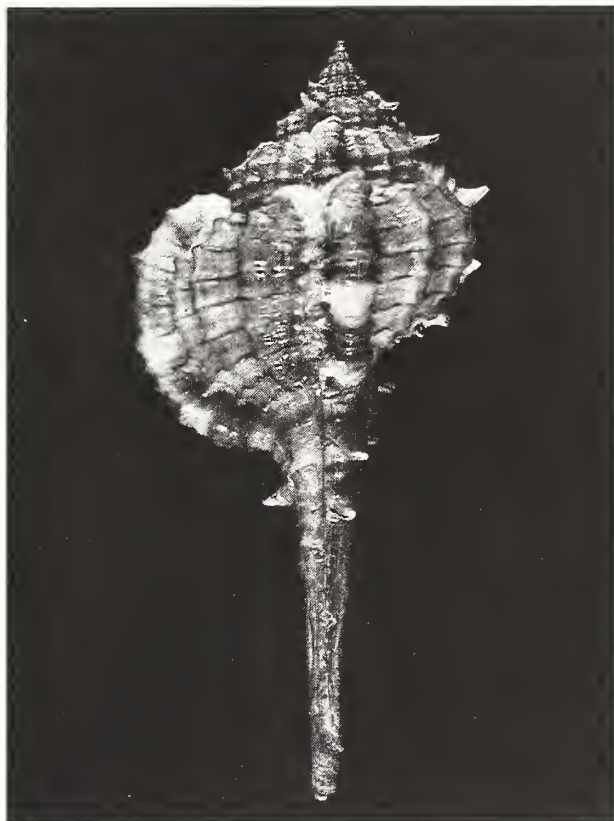


Figure 5. *Haustellum lividus* (Carpenter, 1857), 52.2 x 29.0 mm, Gulf of Tehuantepec, Mexico, in 229 m. Photo: D. K. Mulliner.

Radwin & D'Attilio (1976) did not include this species. While collecting from a shrimp trawler in the Golfo de Tehuantepec, Chiapas, Mexico (station 1-10, 15°37'N, 94°378'W), I found one specimen taken from a depth of 229 m in August 1963 (Figure 5).

--- *Murex ruthae* Vokes, 1988. Additional collection record. In her description of the above species, Vokes stated that paratype "A" is from the channel between Loreto and Isla Carmen, Baja California Sur, Mexico, at a depth of 27-45 m (Ariel Expedition, 29 August 1960). I was on this expedition and collected three specimens of this species on the same haul. They remained unnamed in my collection until 26 October 1995, the day before I started writing on this species. On the final day of the trip, 28 August 1960, our trawling was off Cabo Haro, Guaymas, Sonora, and I collected a specimen from a depth of 36-73 m.

Having been co-organizer of the Ariel Expedition

along with Captain Xavier Mendoza von Borstel, then of Guaymas, we found that the planning was relatively easy until we tried to get government permits for the trip. This, alone, took eight months. The *Ariel* was a former 105-foot U.S. Navy mine sweeper converted into a shrimp boat. I think that all of those who joined us on the expedition were happy with what was collected. Among those who took part were John Q. Burch, Dr. Bruce Campbell, Helen and Joe DuShane, Dr. Antonio García-Cubas, Dr. A. Myra Keen and Gale Sphon.

1015. *Dermomurex myrakeenae* (Emerson & D'Attilio, 1970). A range extension to Panamá. Known as far south as Zihuatanejo, Guerrero, Mexico, I discovered a single crabbed specimen intertidally at Isla Boyarena, Islas Perlas, Panamá.

993. *Murexiella perita* (Hinds, 1844). A range extension to Perú. This species was previously reported



Figure 6. *Murexiella perita* (Hinds, 1844), 17.7 x 10.9 mm, off Caelata la Cruz, Perú, in 18.3-36.7 m. Photo: D. K. Mulliner.

as far south as Panamá and the Galápagos. I also collected this species by trawling from a shrimp boat in 18-37 m off Caelata la Cruz, Perú, on 13-15 April 1972 (Figure 6). The identification was confirmed by Dr. Emily H. Vokes.

BUCCINIDAE

1098. *Bailya anomala* (Hinds, 1844). Additional collection records. At Isla Venado, Panamá, this species is fairly easy to find at low tide if one seeks out flat rocks that are partially buried in mud. Because of the mud on the under surface of the rock, one must look carefully to spot the shell.

On a shark-infested dive (hammerheads) to 30 m, 22 March 1984, I collected a single live specimen of this species as I ascended to 22 m at Isla del Coco. Since Keen (1971) reported only intertidally collected specimens from Guaymas, Sonora, Mexico, to Nicaragua, I also note that the only specimen of which I am aware from Guaymas, is a specimen that I

collected on 28 September 1962 under a rock at 13 m.

1102. *Caducifer nigracostatus* (Reeve, 1846). Additional collection records. Keen (1971) listed the range of this species as Jalisco, Mexico, to Panamá and Shasky (1984) extended the range to Ecuador. In an inlet to Bahía Saladita, Guaymas, Sonora, Mexico, on 5 August 1965, I found two specimens under rocks at a depth of 10 m.

COLUMBELLIDAE

---- *Aesopus chrysallodes* (Carpenter, 1864). A range extension to Ecuador. This species has not been cited south of Bahía San Carlos, Sonora, Mexico.

I have collected this taxon in the following locations: Isla Chivos, Mazatlán, Sinaloa, Mexico, one specimen intertidally under a rock, 26 December 1962; Guayabitos, Sinaloa, Mexico, one specimen dredged in 9-18 m, March 1962; Punta Chame, Panamá, a total of 48 specimens dredged in 1977 and 1986; first island of Islas Dos Amigos, Isla del Coco, under dead coral in 18-30 m; off Bahía Wafer, Isla del Coco, Costa Rica, 15 specimens dredged in 60 m, 5 March 1984; Playas, Ecuador, five specimens intertidally under a rock, 8 March 1970.

---- *Aesopus oblita* (Reeve, 1859). A range extension to Mexico. This species has not previously been reported in the tropical eastern Pacific. It was described from Perú without specifying locality. I found one specimen in 7.6-9.0 m at Tamarindo Cove, Bahía Tenacatita, Jalisco, Mexico on 25 February 1968; one specimen in 7.6-14 m at Cuastecomate, Jalisco, Mexico, 13-20 October 1968; three specimens intertidally at Isla Boyarena, Islas Perlas, Panamá, 27 February - 3 March 1979 and 7 April 1981 (Figure 7). All of the above were under rocks.

Reeve's figure of the species appears to me to be that of an immature specimen due to its thin elongate aperture. In his description he stated that the aperture is small. However, the figured specimen has an elongate aperture half the length of the shell. One of my specimens has an immature aperture similar to the type. Mature specimens of *Aesopus* have a small ovate aperture.

1163. *Aesopus sanctus* Dall, 1919. A new record from Isla del Coco. I found one specimen of this species at Isla Pájaro, Isla del Coco, in 12-15 m under coral, 27 March 1984.

1168. *Aesopus osborni* Hertlein & Strong, 1951. A range extension. This species has not been reported since its original description from specimens taken at Puerto Guatulco, Oaxaca, Mexico. I collected the species at Islas Revillagigedo, Mexico: one specimen as far north as Isla San Benedicto, 25 November 1988, one specimen at Binner's Cove, Isla Socorro, 26 November 1988 and one at Bahía Cornwallis, Isla Socorro, 27 November 1988 (Figure 8). All were collected under rocks at a depth of 11-15 m. I have also found eleven specimens of this species at Bahía Ballena, Golfo de Nicoya, Costa Rica, at a depth of 6-13.5 m, under rocks, 15 March 1984 and 18 May 1985.



Figures 7 & 8. (7) *Aesopus oblita* (Reeve, 1859), 5.9 x 1.6 mm, Isla Boyarena, Islas Perlas, Panamá, intertidally. (8) *Aesopus osborni* Hertlein & Strong, 1951, 4.9 mm, Binner's Cove, Isla Socorro, Islas Revillagigedo, Mexico, in 15 m. Photos: D. K. Mulliner.

1169. *Aesopus subturritus* (Carpenter, 1864). Additional distribution record. No previous report of this species from south of the Islas Tres Marias Islands, Nayarit, Mexico, has been published. I found one

specimen under a rock in 7.6-9.1 m at Tamarindo Cove, Bahía Tenacatita, Jalisco, Mexico, 25 February 1968.

1215. *Bifurcium bicanaliferum* (Sowerby, 1832). A range extension to Perú. Known, on the mainland, as far south as Ecuador, I have one lot with two specimens from a shrimp trawler off Caelata la Cruz, Perú, in depths of 18-36 m, April 1972.

1231. *Mitrella baccata* (Gaskoin, 1852). A range extension to Perú. Reported from Bahía Magdalena, Baja California Sur, Mexico, to Nicaragua, I collected 14 specimens, intertidally under rocks at Playas, Ecuador, 8 March 1970. Also, intertidally at El Rubio, Perú, I found four specimens under rocks, 17 April 1972.

1234. *Mitrella densilineata* (Carpenter, 1864). A range extension to southern Mexico. Apparently known only from the type lot from Cabo San Lucas, Baja California Sur, Mexico, I collected two dead specimens under rocks at La Ventosa, a small village near Salina Cruz, Oaxaca, Mexico, 5-7 July 1963 (Figure 9).



Figure 9. *Mitrella densilineata* (Carpenter, 1864), 6.3 x 2.5 mm. La Ventosa, Salina Cruz, Oaxaca, Mexico, under rocks. Photo: D. K. Mulliner.

1243. *Mitrella pulchrior* (C. B. Adams, 1852). A range extension to Ecuador. Reported only from Panamá, I collected one lot of 26 specimens, under rocks, intertidally at Playas, Ecuador, 8 March 1970.

1244. *Mitrella santabarbarensis* (Gould & Carpenter, 1857). A range extension to Perú. This small columbellid is known from the southern part of the Golfo de California to Ecuador. On 16 April 1972 I collected 14 specimens intertidally under rocks at El Rubio, Perú.

1251. *Steironepion melanosticta* Pilsbry & Lowe, 1932. A new record from Isla del Coco. I have collected five lots each with one specimen from five dive sites in depths of 12-38 m, during April 1983, May 1985 and March 1989.

1259. *Zanassarina poecila* (Pilsbry & Lowe, 1932). A range extension to Costa Rica. Reported from Mazatlán, Sinaloa, Mexico, to San Juan del Sur, Nicaragua (type locality), I have one lot of nine specimens from under rocks collected in Bahía Ballena, Golfo de Nicoya, Costa Rica, March 1984 and May 1985.

BUCCINIDAE

1307. *Nassarius nodicinctus* (A. Adams, 1852). A new record from Isla del Coco. I have collected two specimens from 116 m in a tangle net off Bahía Iglesias, 4 April 1992.

TURRIDAE

1639. *Iredalea ella* (Pilsbry & Lowe, 1932). A new record from Isla del Coco. Known from Guaymas, Sonora, Mexico, to Manabí Province, Ecuador, I have one lot with one specimen from a 9 m dive at Punta Barreto, Isla del Coco, on 19 April 1983.

1640. *Iredalea perfecta* (Pilsbry & Lowe, 1932). A new record from Isla del Coco. This species has the same reported range as *I. ella*. I also have a single specimen of this species dredged in 66 m off Roca Sucia, Isla del Coco, on 23 April 1986.

1643. *Bellaspira melea* Dall, 1919. A new record from Isla del Coco. Reported from the Golfo de California to Colombia, I have two lots from Isla del Coco, taken by dredging in coral rubble, the first in 36-67 m off Bahía Chatham for a total of five specimens in April 1985 and April to May 1986. The second lot was

taken in 30-39 m off the east side of Roca Sucia in April 1986.

1681. *Crassispira turricula* (Sowerby, 1834). This species, with a wide distribution, is reported from Isla del Coco for the first time. One lot of five specimens was dredged in 15-40 m off Bahía Chatham in May 1985 and April to May 1986.

1691. *Crassispira bifurca* (E. A. Smith, 1888). A range extension to Perú. Reported from the Golfo de California to Santa Elena Peninsula, Ecuador, I collected one specimen intertidally under a rock at El Rubio, Perú, on 16 April 1972.

1770. *Mitromorpha carpenteri* Glibert, 1954. A new record from Isla del Coco. I have collected four lots totaling 17 specimens from four dive sites in April 1983, May 1984, May 1985, and May 1986. I also have a fifth lot of four specimens dredged in 46-70 m off Bahía Chatham in May 1986.

1776. *Clathurella rigida* (Sowerby, 1834). A range extension. There have been no previous reports from either the Islas Revillagigedo (Emerson, 1995) or Isla del Coco (Montoya, 1983). I have one lot of one specimen taken from under a rock at a depth of 13 m at Punta Ortolan, Isla San Benedicto, Islas Revillagigedo, on 25 November 1988 and three lots from three dive sites at Isla del Coco in depths of 12-38 m for a total of 34 specimens in April 1983, May 1984 and March 1989. An additional specimen was taken in a tangle net off Isla del Coco from 91 m in March 1989.

1778. *Nannodiella nana* Dall, 1919. A new record from Isla del Coco. Known from the Golfo de California to Isla Gorgona, Colombia, I have one lot of two specimens from Isla del Coco dredged in 61 m off Bahía Wafer on 5 March 1984.

1789. *Kurtziella plumbea* (Hinds, 1843). A range extension to Isla del Coco and Panamá. Known from British Columbia, Canada, to Mazatlán, Sinaloa, Mexico, I have two lots with a total of five specimens taken by shrimpers from 19-20 fathoms (34-36 m) off the Chiapas coast, Golfo de Tehuantepec, Mexico, in March 1961 and October-December 1962; one lot with one crabbed intertidal specimen from Isla Venado, Panamá, in March 1970 and one lot with one specimen from 5 m under coral at Bahía Chatham, Isla del Coco, in April 1983.

1792. *Kurtziella beta* (Dall, 1919). A range extension to Perú. Reported from the Farallon Islands (west of San Francisco), California to Bahía Santa María, Baja California Sur, Mexico, I collected a single live specimen while aboard a shrimp trawler working in 18-36 m off Caelata La Cruz, Perú, on 13-17 April 1972 (Figure 10).



Figure 10. *Kurtziella beta* (Dall, 1919), 4.1 x 2.0 mm, Caelata La Cruz, Perú, in 18-36 m. Photo: D. K. Mulliner.

1798. *Tenaturris merita* (Hinds, 1843). A new record from Isla del Coco. There have been no previous reports of this species from Isla del Coco. I have collected five lots totaling 16 specimens from four dive sites in March 1984, February 1988, March 1989, February 1991 and April 1983.

1805. *Platycythara curta* (Dall, 1919). Additional collection record. This tiny species is known from only three specimens, the first being the holotype which was taken in 53 m in Bahía Panamá, Panamá, at U.S. Bureau of Fisheries station 2766. The second specimen

was taken at a depth of 1.5 m at Isla Zacatillo, Golfo de Fonseca, El Salvador (13°18'N, 87°46'W), on 27 January 1973, leg. Anthony Ferreira (LACM 73-57). The third specimen I collected intertidally from under a rock at Isla Venado, Panamá, 4 April 1981 (Figure 11).



Figure 11. *Platycythara curta* (Dall, 1919), 2.4 x 1.1 mm, Isla Venado, Panamá. Photo: D. K. Mulliner.

1810. *Kurtzia arteaga* (Dall & Bartsch, 1910). A range extension to Perú. Previously reported from as far south as the Golfo de Tehuantepec, Mexico, I collected two specimens while aboard a shrimp trawler off Caelata La Cruz, Perú, on 13-15 April 1972.

1816. *Agathotoma alcippe* (Dall, 1918). A new record from Isla del Coco. Two lots from two dive sites in depths of 12-23 m, one specimen in each lot was taken, 22 April 1989 and 4-6 April 1992. One specimen was also dredged in 100-133 m off Bahía Chatham, March 1986.

1818. *Agathotoma finitima* (Pilsbry & Lowe, 1932). A range extension to Perú. Known from San Juan del Sur, Nicaragua, to Salinas, Ecuador, I collected 12 crabbed specimens intertidally at El Rubio, Perú, 16 April 1972.

1821. *Agathotoma stellata* (Mörch, 1860). A range extension to Perú. Known as far south as the Santa Elena Peninsula, Ecuador (Keen, 1971), I have one lot of two crabbed specimens also taken intertidally at El Rubio, Perú, 16 April 1972.

1835. *Ithycythara penelope* (Dall, 1919). A new record from Isla del Coco. It has been reported from Guaymas, Sonora, Mexico, to Bahía Panamá, Panamá, and the Galápagos (Keen, 1971) and Manabí Province, Ecuador (Shasky, 1984). I have 50 specimens dredged May 1985 and April-May 1986 in 30-62 m in coral rubble off Bahía Chatham, and nine specimens dredged in 61 m off Bahía Wafer, Isla del Coco, 5 May 1984.

1839. *Daphnella mazatlanica* Pilsbry & Lowe, 1932. A new record from Isla del Coco. Known from the head of the Golfo de California to Manta, Ecuador (Keen, 1971), I found one specimen intertidally, under a rock at Bahía Chatham, Isla del Coco, in April-May 1986.

1840. *Daphnella retusa* McLean & Poorman, 1971. A new record from Isla del Coco. Known from the Golfo de California to Islas Secas, Panamá (Keen, 1971) to Ecuador (Shasky, 1984). Two lots of one specimen each were dredged off Bahía Chatham, one in 15-23 m and the other in 46-69 m, May 1985. I also collected one specimen off Roca Sucia, Isla del Coco, diving in 18-34 m, March 1984.

1848. *Microdaphne trichodes* (Dall, 1919). A new record from Isla del Coco. This species has a wide distribution throughout the Panamic Province and the Indo-Pacific (Keen, 1971). I have a total of 17 specimens from three dive sites at Isla del Coco in depths of 9-40 m and one specimen from a tangle net from 91 m in April 1983, March 1984, March 1989 and February 1991.

RISSEOELLIDAE

238. *Rissoella tumens* (Carpenter, 1857). Additional distribution records. Described from Mazatlán, Sinaloa, Mexico, it is known from Guaymas, Sonora, Mexico (DuShane & Poorman, 1967), south to the Islas

Galápagos (Shasky, 1989). I have one lot of four specimens taken in 13 m at Isla San Benedicto, Islas Revillagigedo, Mexico, 25 November 1988 and four lots from dive sites at depths of 12-36 m and one lot from 91 m in coral rubble taken in a tangle net at Isla del Coco, 14-16 April 1983, 7 March 1984, May 1985, and 21-30 March 1989.

AMATHINIDAE

782. *Phasianema saxicola* (C.B. Adams, 1852) [*Litiopa*]. A new record from Isla del Coco. This species was described from Panamá. Ponder (pers. comm.) relates this species to the above genus which is in the pyramidellid family Amathinidae. I have collected this species from nine dive sites at Isla del Coco, at depths of 30-33 m. These specimens are now in the Santa Barbara Museum of Natural History (SBMNH 143023, 2 spec., 14 April 1983; 143024, 23 spec., 14 April 1983; 143025, 3 spec., 22 March 1984; 143026, 24 spec., 23 May 1985; 143027, 6 spec., 29 March 1986; 143028, 1 spec., 14 February 1991).

PYRAMIDELLIDAE

2023. *Triptychus incantatus* Hertlein & Strong, 1939. A new record from Isla del Coco. Described from Santa Elena, Ecuador, I have taken four specimens of this species by dredging in 46-75 m in coral rubble off Bahía Chatham, Isla del Coco, 1985. This specimen is in the Santa Barbara Museum of Natural History (SBMNH 143029).

HAMINOIEDAE

2240. *Arys chimera* Baker & Hanna, 1927. A range extension to Panamá. This species has not been reported since Keen (1971). She listed the range from the Golfo de California to Acapulco, Guerrero, Mexico. I collected a single specimen (8.6 mm) in 12-14 m at night on the east side of Isla Landones, Golfo de Chiriquí, Panamá, on 16 April 1993. This specimen is now in the Santa Barbara Museum of Natural History (SBMNH 142996).

ACKNOWLEDGMENTS

When this paper was first conceived, I intended it to be fairly brief. Since starting it I have made many additions to the number of species. I thank Carole Hertz who has been very patient with me as I brought her numerous revisions. Without Dave Mulliner and his photographic genius this paper would have been disappointing. Bert Draper, another excellent

photographer, supplied photographs (Figure 3a-c) for *Zebina (Tiphycerina) preposterum*. My thanks also go to Henry Chaney of the Santa Barbara Museum of Natural History and Jim McLean of the Los Angeles County Museum of Natural History for supplying me with accession numbers for specimens in their respective institutions and to Carol Skoglund for carefully reviewing a draft of the paper and making suggestions which much improved the paper.

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A SECOND RECORD OF THE MURICID *HEXAPLEX NIGRITUS*
(GASTROPODA: MURICIDAE) AT BIRD ROCK,
LA JOLLA, CALIFORNIA

KENT D. TREGO

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Recently, Spencer Luke of the Benthic Invertebrate Collection of the Scripps Institution of Oceanography brought to my attention a muricid which had been collected at the Bird Rock area of La Jolla, California. The specimen, 60 mm in length, was live collected in the intertidal area at low tide on 15 March 1995. I identified the specimen as *Hexaplex nigrinus* (Philippi, 1845) (Figures 1, 2). The specimen remains in the Benthic Invertebrate Collection of Scripps Institution of Oceanography (M6901).

Farmer (1987) reported collecting a live 58 mm specimen of the same species at Bird Rock. This specimen, comparable in size to the specimen collected in 1995 is in the possession of the Department of Invertebrate Zoology of the San Diego Natural History Museum.

The occurrence of these two *Hexaplex nigrinus* is, of course, unusual because Keen (1971) confined this species to the Gulf of California, and Radwin and Hemingway (1976) in discussing *Muricanthus radix*



Figures 1 & 2. *Hexaplex nigrinus*, (1) dorsal view and (2) ventral view of 60 mm specimen. Photos: D. K. Mulliner.

noted "a single live specimen [of the *nigritus* form] in a marshy area near the entrance to Scammon's Lagoon...." As yet, there is no evidence for a population of *H. nigritus* existing at the Bird Rock location. Although El Niño may be considered as an emplacement mechanism, the fact that two specimens of this muricid species show up at the same general area some eight years apart may imply artificial introduction by man.

I wish to thank Mr. David Mulliner for providing the photos of the *H. nigritus* specimen.

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NOTICE OF THREE ANNUAL MALACOLOGICAL MEETINGS

The 62nd Annual Meeting of the American Malacological Union (AMU) will take place from 29 June to 3 July at the Field Museum in Chicago, Illinois, with the Chicago Shell Club taking an active role.

In addition to Contributed Papers and Posters, there will be a Freshwater Symposium, a Shell Power Symposium, a Collection Management Symposium/Workshop and Mollusca and the Internet. There will be a FMNH Library Rare Book Exhibit and Supply Vendor Displays as well as other social events such as the President's Reception, Auction, Banquet and an Architecture Cruise.

For further information, contact President Rüdiger Bieler (312) 922-9410 [FAX (312) 663-3397, E-mail: bieler@fmnh.org].

The 25th Annual Convention of the Conchologists of America (COA) will be held at the Tradewinds Resort at St. Pete Beach, Florida, from 14-19 July and is hosted by the St. Petersburg Shell Club. In addition to the regular programs, two special seminars are planned. One is entitled "Public Relations for Shell Clubs" and the second "The Future of Shell Collecting."

There will be the traditional welcome party, annual

auction and silent auction, bourse, seven optional field trips and the annual banquet with guest speaker Dr. Paula Mikkelsen of the Delaware Museum of Natural History.

For additional information, contact either Betty Lipe (813) 360-0586 or Eleanor Rothoff (813) 527-4707.

The Western Society of Malacologists (WSM) will hold its 29th Annual Meeting at the Handlery Hotel and Resort in San Diego, California, from 23-27 June.

In addition to contributed Papers and Posters, three symposia are planned: Functional Morphology and Natural History of Molluscan Feeding, Invertebrate DNA: Prospects and Problems and Biology and Evolution of Cypraeoidea. The meeting will open with a wine and cheese reception hosted by the San Diego Shell Club. In addition to the traditional auction and reprint sale, evening slide shows, shell displays and annual banquet, several field trips are scheduled (Hubbs-Sea World Research Institute, San Diego paleontology sites and the Stephen Birch Aquarium).

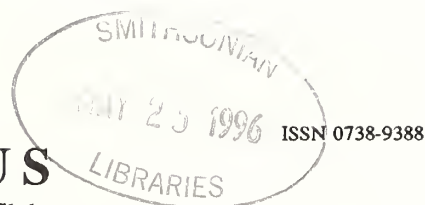
For further information, contact President Hugh Bradner (619) 459-7681 [FAX (619) 459-0657, E-mail: hbradner@ucsd.edu].

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THE FESTIVUS

A publication of the San Diego Shell Club



Volume: XXVIII

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The publication date appears on the masthead above.

Single copies of this issue: \$5.00 plus postage.

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

PROGRAM

Patterns of Change in the Marine Environment:

Longterm Population and Community Studies at Bahía de los Angeles, Baja California, Mexico

Dr. Hans Bertsch, Associate Professor, Department of Mathematics and Natural Sciences, National University, a longtime student of the natural world of Baja

California, will give an illustrated program centered on the marine environment at Bahía de los Angeles in the Gulf of California.

Meeting date: 16 May 1996
Shells of the month: Olive shells

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CLUB NEWS

The Auction/Potluck '96

And what a grand party it was!

Over 45 members and guests began streaming in to the clubhouse of host Wes Farmer's condo (at the new starting time of 5 p.m.) laden with wonderful-smelling dishes for the potluck dinner. The auction table and silent auction, set up in record time, were soon crowded with people checking the many fine donations of books and specimen shells and marking their lists for the big event to begin promptly at 7 p.m. Others were happily greeting good friends and sampling "Dave's Punch" ably made by Bill Romer.

As always, the dinner was spectacular. The food contributions seem to get better every year with members savoring again some repeats of last year's favorite dishes and raving about some new entries. The desserts, plentiful and more than amply sinful, attracted everyone. This was not diet night.

At the stroke of 7 p.m., the auction got underway with auctioneer Carole Hertz cajoling the enthusiastic crowd to ever bigger and better bids for the choice auction material on the table. And what material there was -- *Conus milneedwardsi*, *Cypraea guttata*, *Cypraea jeaniana aurata*, *Voluta bednalli*, wonderful fossils, an extraordinarily large orange *Lyropecten subnodosus*, a gigantic Tennessee River bivalve, a D'Attilio drawing, Oldroyd's complete original *The Marine Shells of the West coast of North America* and both Keen's 1971 and 1958 volumes to name just a few. It was a fun-filled, rowdy, exciting and very successful auction.

Weary members finally bid the last bid at about 10:30 p.m. and applauded the great party, each other, the auctioneer and the three wonderful "gofers" who helped distribute the auction shells all evening, Lauren Buck, Jessica Reitz and Joanne Romer.

The Club thanks all those who helped in making the auction possible - those who donated shells, bought shells, phoned members, bagged the material, helped set up, helped clean up, bought supplies and managed the food and drinks.

The following people generously donated to the 1996 Auction/Potluck: Terry Arnold, Paula & George Barton, Joe Bibbey, Ed & Pat Boyd, Hugh & Marge Bradner, Billee Brown, Larry Buck, Larry Catarius, Wes Farmer, Joyce Gemmell, Brian Hayes, Richard

Herrmann, Carole & Jules Hertz, Kim & Linda Hutsell, John Jackson, Kirstie Kaiser, June King, Kay Klaus, John LaGrange, Marge & Ken Lindahl, Ann Marti, Mike & Karen Mason, Margaret & Dave Mulliner, Rick Negus, Rosemary & Frank Pierce, Bob Pike, Don & Jeanne Pisor, Chuck Reitz, Dale Roberts, Wally Robertson, Bill & Carol Romer, Nancy & Bill Schneider, Don Shasky, Carol & Paul Skoglund, Kent Trego, Charlie Waters, Gladys Weber and Jody Woolsey.

The 1996 Greater San Diego Science and Engineering Fair

For the 24th consecutive year, the Club has participated in the Greater San Diego Science and Engineering Fair. The committee (Hans Bertsch [chair] and Carole and Jules Hertz) selected as the Club winner Gerard James Rymer, a senior at Gompers Secondary School. Gerard was also a first place winner in zoology in the senior division.

Gerard's winning project is entitled, "*Strongylocentrotus purpuratus*: chemotactic response to *Macrocystis pyrifora* extracts." He will be invited to give an overview of his project at an upcoming meeting at which time he will be awarded his prize from a choice of three texts on zoology, *Between Pacific Tides*, *Intertidal Invertebrates of California* or *Invertebrate Zoology*.

A Date for the Bizarre Bazaar

Marge and Hugh Bradner have graciously made their garden available for the Club's annual Bizarre Bazaar. It will be held on the afternoon of Sunday August 4th. Mark your calendars and details will be published later.

Additions to the Roster

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NEW DISTRIBUTIONAL RECORDS IN THE GASTROPOD FAMILIES
TORNIDAE, PLANAXIDAE, AND VANIKORIDAE
IN THE NORTHERN GULF OF CALIFORNIA

CAROLE M. HERTZ¹, BARBARA W. MYERS² & JOYCE GEMMELL³

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Abstract: New distributional records are reported here for two species of Tornidae, *Macromphalina symmetrica* (Pilsbry & Olsson, 1945) and *M. equatorialis* (Pilsbry & Olsson, 1945); one species of Planaxidae, *Fossarus tuberosus* Carpenter, 1857, and one of Vanikoridae, *Vanikoro aperta* (Carpenter, 1864). The species were identified in the Gemmell collection from the San Felipe area, Baja California, Mexico.

Background: In the ongoing study of mollusks in the Gemmell collection from San Felipe and environs on the Baja side of the northern Gulf of California, collected from 1965 to 1976, we have reported a number of species from the area that had not been noted previously, particularly in families having small, inconspicuous species not extensively studied nor actively sought by many collectors (Gemmell, Hertz & Myers, 1980, 1995; Hertz, Myers & Gemmell, 1992a,b, 1994; Myers, Hertz & Gemmell, 1989, 1990, 1991).

Little taxonomic work has been published on *Macromphalina* since Pilsbry & Olsson (1945, 1952). They included the genus in the Vitrinellidae as did Moore (1965). Keen (1971) placed the genus in the Fossaridae and it was later transferred to the Tornidae (Abbott, 1974).

Houbrick (1990) placed the genus *Fossarus* in the Planaxidae (subfamily Fossarinae) based on study of the anatomy. The systematic position of Vanikoridae has not been changed since Keen (1971).

Following is a listing of the four species newly reported from the San Felipe area. The Gemmell specimens were compared with material in the Carol Skoglund collection as well as with specimens in the Santa Barbara Museum of Natural History (SBMNH) and are illustrated here by means of camera lucida

drawings by Gemmell using a Wild microscope. Unless otherwise noted, shells were collected empty. All specimens here studied in the Gemmell collection are currently housed in the San Diego Natural History Museum (in the Department of Entomology).

TORNIDAE

Genus *Macromphalina* Cossmann, 1888

Macromphalina equatorialis (Pilsbry & Olsson, 1945)
(Figures 1-3)

Chonebasis equatorialis Pilsbry & Olsson, 1945, Proceedings of the Academy of Natural Sciences of Philadelphia 97:264-265, pl. 24, figs. 6, 6a, 6b.

Gemmell material studied: 12 specimens, 1.0-2.2 mm max. diam., Puertecitos, in grunge.

2 specimens, 1.5 & 2.5 mm max. diam., Playa Alicia, S of San Felipe, in fine sand among rocks, minus 6 ft tide, April 14-16, 1976.

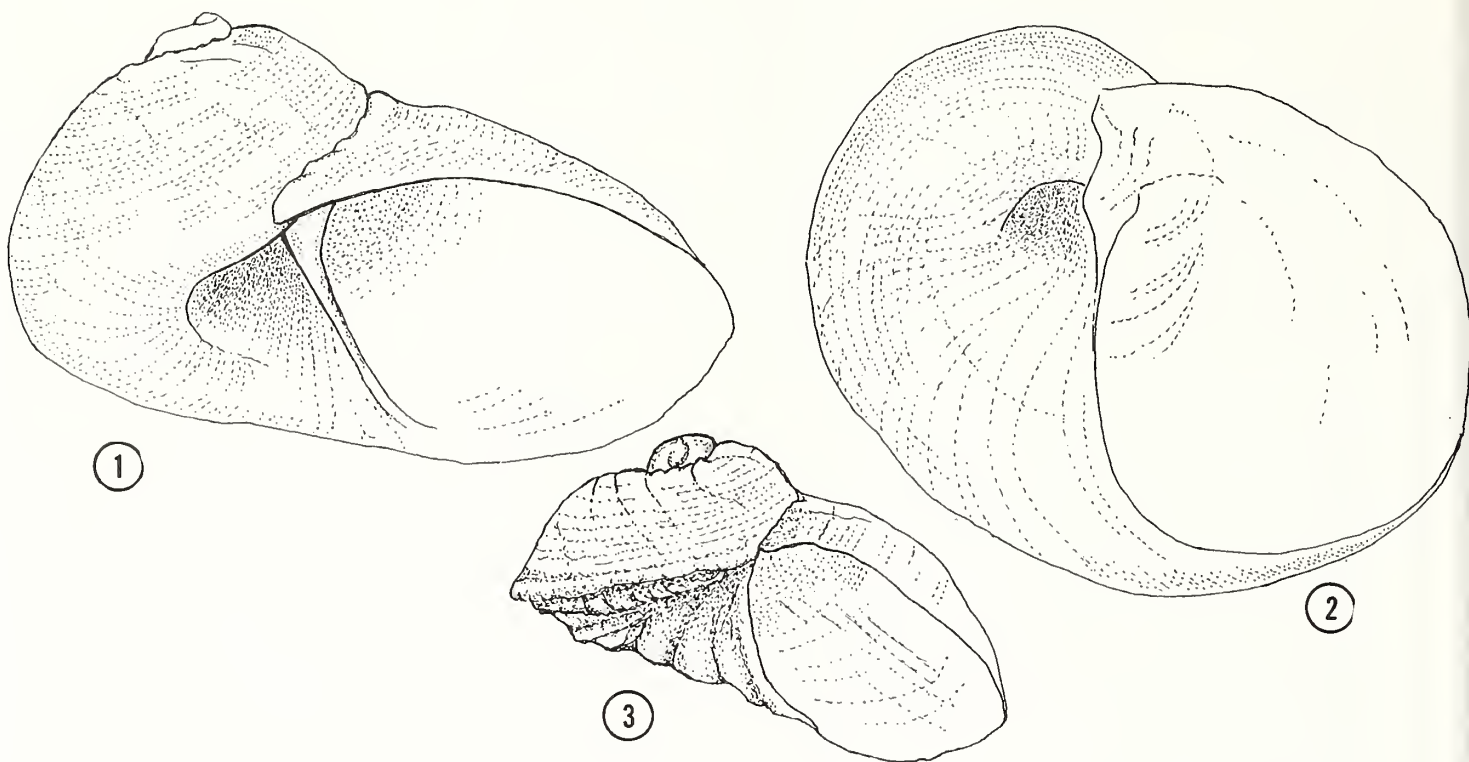
9 specimens, 1.2-3.8 mm max. diam., Playa Alicia, S of San Felipe, under small rocks, November 1968.

2 specimens, 1.5 & 4.3 mm max. diam., N side of Bahía Willard, San Luis Gonzaga, in drift, November 1969.

Previous reported distribution: Punta Callo, Manabí

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Figures 1-3. *Macromphalina equatorialis* (Pilsbry & Olsson, 1945), (1-2) apertural & dorsal views of 4.0 mm specimen, N. side of Bahía Willard, San Luis Gonzaga, (3) apertural view of 1.5 mm specimen showing keel, Playa Alicia, San Felipe.

Province, Ecuador (Pilsbry & Olsson, 1945; Keen, 1971); Puerto Peñasco, Sonora, intertidal to 10 m (Skoglund & Koch, 1995).

Remarks: Pilsbry and Olsson's illustration of the type, a 1.9 mm diameter specimen, clearly shows a delicate keel or "seam-like sutural border." This is also apparent on the 1.2 mm Gemmell specimen (Figure 3). On larger Gemmell specimens (Figures 1, 2) this becomes obsolete.

Additional uncited material studied in the Caro Skoglund collection is from Santa Cruz (4 specimens) in drift, 1967-1980, Chacalita (3 specimens) dredged in 3-5 m, December 1973, both Nayarit, Mexico; La Cruz de Huanacastle, Bahía Banderas (1 specimen) 1972-1979, Caleta de los Angeles, Bahía Tenacatita (2 specimens) intertidal, December, 1977, both Jalisco, Mexico; Puerto San Carlos, Bahía Magdalena (1 specimen), dredged 2-10 m, 1979, Baja California Sur, Mexico; Balboa, Panamá (1 specimen) dredged commercially from Bahía de Panamá, April 1981.

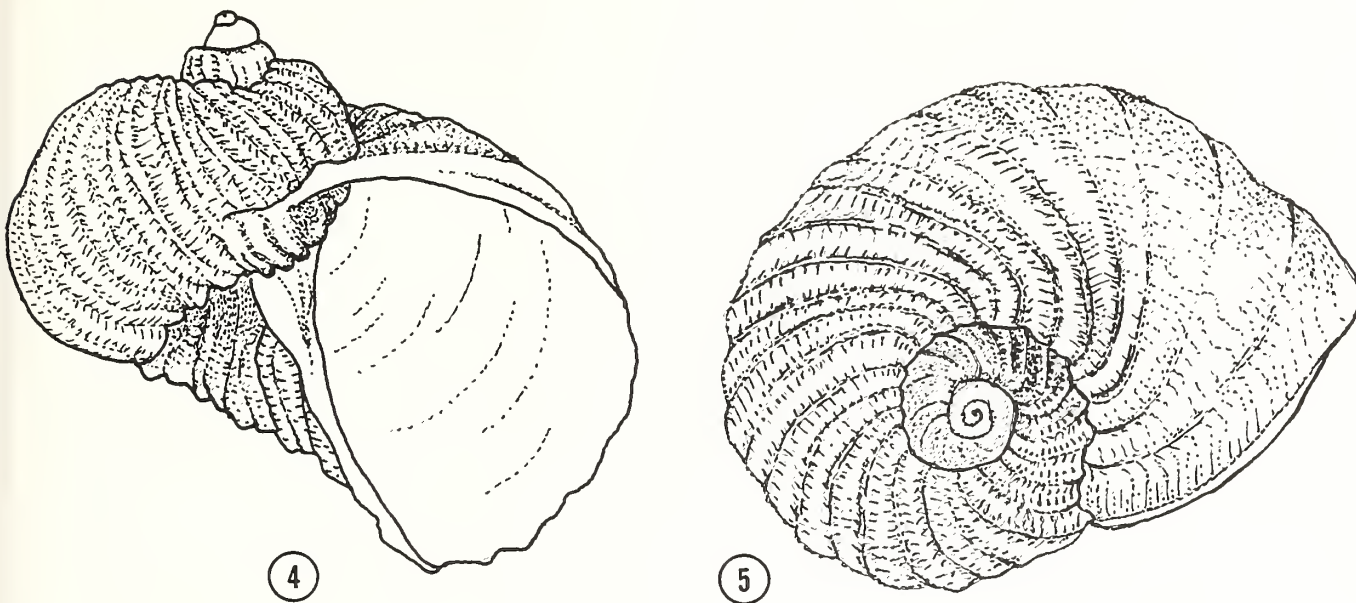
The Gemmell specimens from San Felipe, Puertecitos and San Luis Gonzaga place the species on the Baja side of the northern Gulf for the first time. The Skoglund specimens extend the known range of the species to the Pacific coast of Baja California and to Panamá.

Macromphalina symmetrica (Pilsbry & Olsson, 1945)
(Figures 4 and 5)

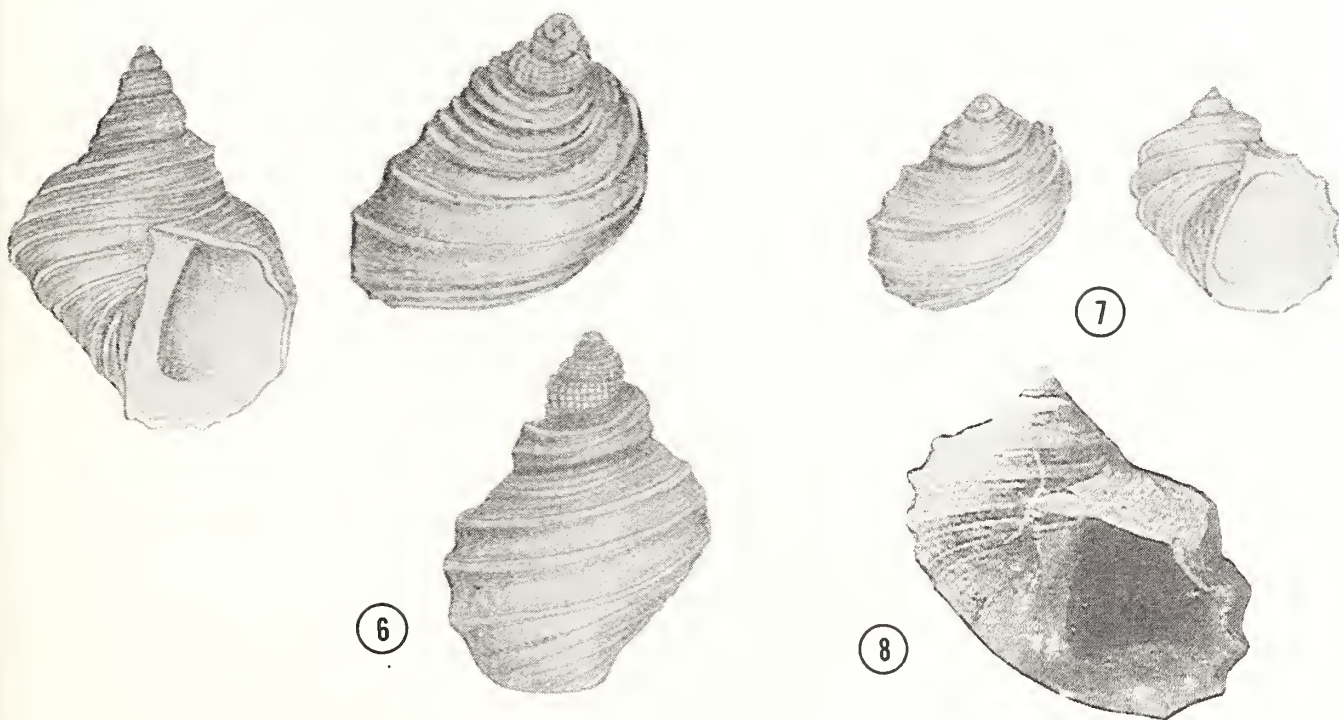
Chonebasis symmetrica Pilsbry & Olsson, 1945:97:261, pl. 24, figs. 3, 3a.

Gemmell material studied: 1 specimen, 2.2 mm max. diam., Puertecitos, in grunge.

Previous reported distribution: Ecuador (Keen, 1971; Pilsbry & Olsson, 1945); Bahía San Carlos, Sonora, Mexico (F. & L. Poorman, 1988); Bahía la Cholla, Sonora and off Puerto Escondido, Baja California Sur, intertidal to 52 m (Skoglund & Koch, 1995).



Figures 4 & 5. *Macromphalina symmetrica* (Pilsbry & Olsson, 1945), 3.8 mm max. diam., Puertecitos, in grunge (4) apertural view (5) apical view.



Figures 6-8. (6) *Fossarus tuberosus* Carpenter, 1857, (6) syntypes, after Brann (1966) (7) *Fossarus angulatus* Carpenter, 1857, syntype, after Brann (1966) (8) *Fossarus purus* Carpenter, 1864, holotype, after Palmer (1963).

Remarks: Shell has a repaired break where the axial sculpture changes from heavy to fine. Appears close to *Macromphalina hancocki* Pilsbry & Olsson, 1952, but the Gemmell shell does not have the brownish nucleus of *M. hancocki*. The Gemmell specimen places the species in the northern Gulf at Puertecitos.

PLANAXIDAE

Subfamily Fossarinae Troschel, 1861

Genus *Fossarus* Philippi, 1841

Fossarus tuberosus Carpenter, 1857
(Figures 6, 9-12)

Fossarus tuberosus Carpenter, 1857:354. Fig'd Brann (1966, p. 63, pl. 38, fig. 404 [tab. 1700]).

Gemmell material studied: 1 specimen, 1.5 mm L, Pta. Estrella, San Felipe, dredged, May 1968.

2 specimens, 2.0 & 3.2 mm L, Radar Beach, off San Felipe, in grunge, April 1971.

3 specimens, 1.5-2.2 mm L, 8 km S of Puertecitos.

Previous reported distribution: Mazatlán, Sinaloa, Mexico (Carpenter, 1857; Keen, 1971); Islas Galápagos (Shasky, 1989).

Remarks: We have identified the species as *F. tuberosus* (Figure 6) rather than *F. angulatus* (Figure 7) both of Carpenter, 1857, or *F. purus* Carpenter, 1864 (Figure 8). Both *F. tuberosus* and *F. angulatus* were described from Mazatlán, collected on bivalves: three specimens of *F. tuberosus* on *Chama* and *Spondylus* and two specimens of *F. angulatus* on *Spondylus*. According to Keen (1968:424), the remaining syntype of *F. angulatus* in the British Museum of Natural History is almost completely disintegrated. *Fossarus purus* was described from Cabo San Lucas, Gulf of California, collected by Mr. John Xantus of the U.S. Coast Survey. Table I details the characters of the three species based on their original descriptions and type figures in Brann (1966, pl. 38, fig. 404) and Palmer (1963, pl. 66, figs. 4, 4a) as well as the comments on the syntypes by Keen (1968) and Palmer (1963:342-343). It compares the above-mentioned three species with the characters of the Gemmell and Skoglund material studied, hereafter referred to as the G/S specimens.

As can be seen in Table I, all the species have the same general size and shape with large open aperture, wide umbilicus and strong spiral keels varying in number. However, the spire is higher in *F. tuberosus* and the G/S specimens (Figures 6, 9-12) and is acute in

F. angulatus specimens. Both *F. tuberosus* and the G/S specimens have a brown protoconch of 3⁺ whorls, cancellate and tilted to the left. The protoconch in *F. angulatus* and *F. purus* is of two whorls.

Fossarus tuberosus has 6 whorls and the G/S specimens 5-6 whorls depending on the size. The other two species have 4 or less. A periostracum is noted only for *F. tuberosus* and we observed traces of this on many of the G/S specimens. On one Skoglund specimen (Figures 11, 12), the shell is completely covered by the pale tan periostracum with hairs on the keels.

The aperture of all the species is large and angulate, reflecting the keels. Only *F. tuberosus* and the G/S specimens have a broad callus on the columella. *F. angulatus* is listed as having "no trace of callosity" while no callus is mentioned for *F. purus*.

Although the original descriptions of *F. angulatus* and *F. tuberosus* state the colors white-black, purple colored, or maculated, no indication of color pattern can be seen in the figures of the types. All the G/S specimens are white with a brown nucleus. Only *F. purus* is described as white.

Because the G/S specimens have the high spire, 3⁺ whorled tilted nucleus, pale tan, hairy periostracum and callosity on the columella, we have identified them as *F. tuberosus*.

The Gemmell material extends the distribution to San Felipe. Specimens in the Skoglund Collection extend the distribution of *F. tuberosus* to Santa Cruz (Nayarit) and Puerto Peñasco, Sonora, Mexico, all collected intertidally, and to Bahía Tenacatita, Jalisco, Mexico. One specimen reported from the Laura Shy collection is listed questionably as *F. tuberosus* from off Puertecitos by DuShane (1962).

VANIKORIDAE

Genus *Vanikoro* Quoy & Gaimard, 1832

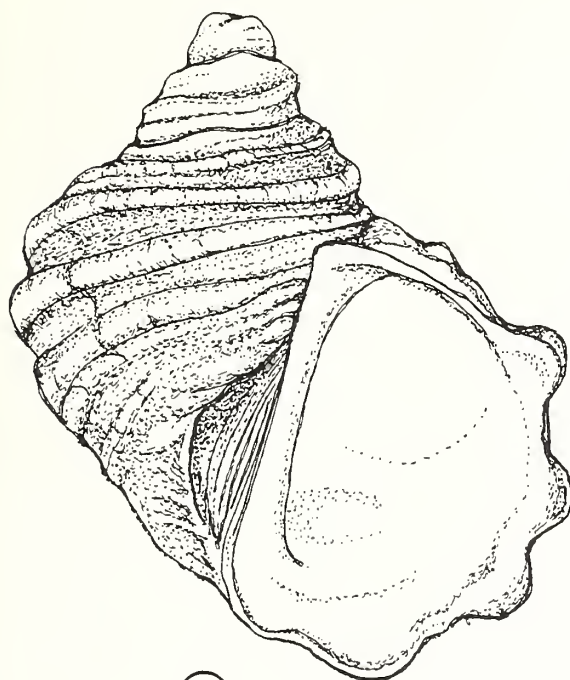
Vanikoro aperta (Carpenter, 1864)
(Figures 13-15)

Narica aperta Carpenter, 1864:13:476. Fig'd Keen (1971, fig. 797 [holotype]).

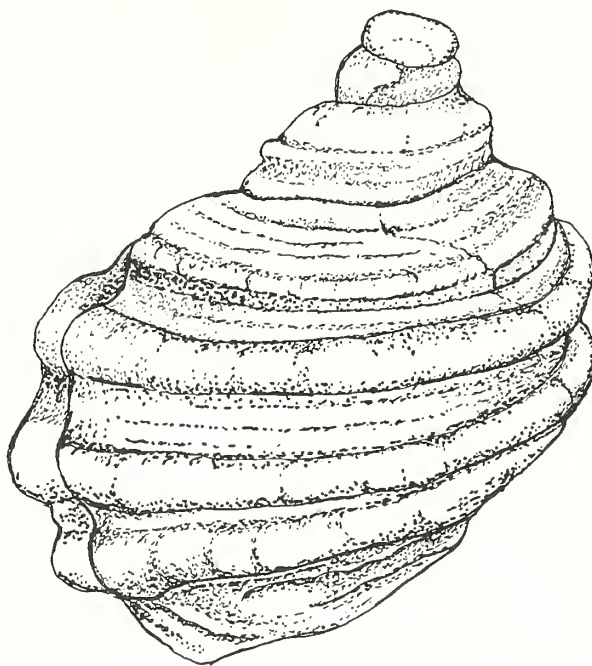
Gemmell material studied: 4 specimens 1.6-4.2 mm max. diam., Puertecitos, in grunge.

7 specimens, 1.4-6.1 mm max. diam., Pta. San Felipe, alive under rocks.

Previously reported distribution: Cabo San Lucas to Guaymas, Sonora (Keen, 1971); Bahía San Carlos,

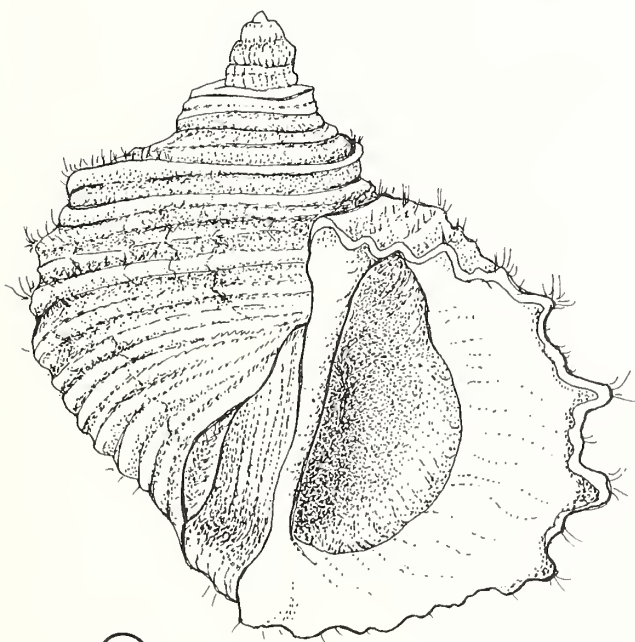


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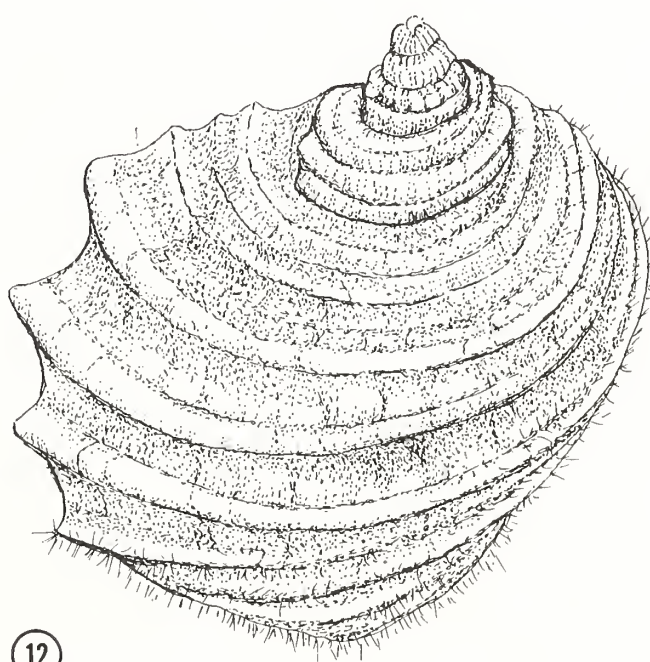


10

Figures 9 & 10. *Fossarus tuberosus* Carpenter, 1857, 1.5 mm max. diam., Gemmell collection (9) apertural view (10) dorsal view.



11



12

Figures 11 & 12. *Fossarus tuberosus*, ± 2 mm max. diam., (11) apertural view (12) dorsal view from lot of 2 specimens, live collected with periostracum, Gulfito, Puntarenas, Costa Rica, intertidal, N of bay entrance, leg. C. Skoglund, April 1983.

Sonora, Mexico (Poorman & Poorman, 1988); Manabí Province, Ecuador (Shasky, 1984).

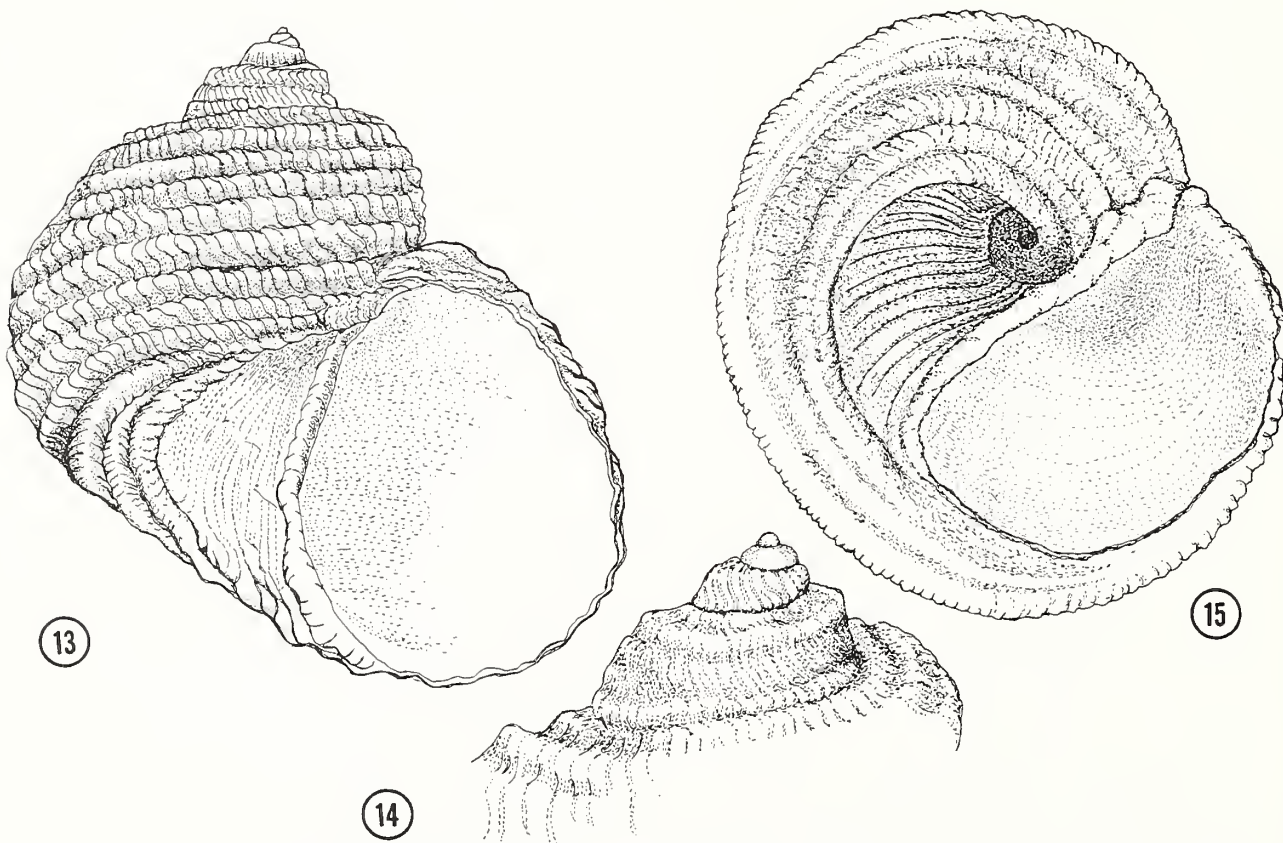
Remarks: We compared the Gemmell specimens with the similar *Vanikoro galapagana* Hertlein & Strong, 1951 (see holotype figures, pl. 11, figs. 7, 8). From the original description the only difference stated between *V. aperta* and *V. galapagana* was the "stronger, more nodulose spiral threads" of *V. galapagana*. It was stated that the umbilicus in *V. galapagana* is "narrow, deep" whereas the umbilicus of *V. aperta* is "maximo, carinato." Keen (1971:455) figured the holotype of *V. aperta* (USNM 15897) and noted the large umbilicus "bounded by a heavy rib." This feature is clearly evident in the Gemmell specimens (Figure 15).

Specimens of *V. aperta* in the Skoglund collection include five lots: one lot of 2 specimens from Playa Alicia, San Felipe, collected with Gemmell, March 1976, and 4 specimens found intertidally on dead bivalve shells from Punta La Gringa, Bahía de los Angeles, both in Baja California, Mexico; a lot of 4 intertidal specimens from Bahía la Cholla, 15

September 1970, 43 specimens in drift at high tide line, Estero Morua, S of Puerto Peñasco, 1968-1978, and 12 intertidal specimens from Puerto Lobos, Cabo Tepoca, 16-17 August 1970, all in Sonora, Mexico. Based on the large umbilicus bounded by a heavy rib and the type locality at Cabo San Lucas (*V. galapagana* is known only from the Galápagos), we have identified the Gemmell specimens as *V. aperta*. This is the first report of the species in the northern Gulf of California at San Felipe and Puertecitos (Gemmell specimens) and on the mainland side of the Gulf in the Puerto Peñasco area to Cabo Tepoca and at Bahía de los Angeles, Baja California, Mexico (Skoglund specimens).

ACKNOWLEDGMENTS

We thank the San Diego Natural History Museum for work space in the Entomology Department and express our appreciation to Carol Skoglund for generously making her collection available to us for study and for critically reading drafts of the manuscript.



Figures 13-15. *Vanikoro aperta* (Carpenter, 1864). 4.2 mm max. diam., from San Felipe, under rocks (13) apertural view (14) dorsal view of spire (15) basal view.

Table I: Comparison of G/S specimens with characters of *Fossarus tuberosus*, *F. angulatus* and *F. purus* as reported from original descriptions and notes of Keen (1968) and Palmer (1963)

	<i>Fossarus tuberosus</i>	<i>Fossarus angulatus</i>	<i>Fossarus purus</i>	Gemmell & Skoglund Specimens
Size	2 syntypes: 1.1 mm (fig'd Brann, 1966, pl. 38, fig. 404)	1 syntype, 1.8 mm (fig'd Brann, 1966, pl. 38, fig. 405)	1.2 ⁺ mm L x \pm 1.5 mm diam., (fig'd Palmer, 1963, pl. 66, figs. 4, 4a)	1.4-6.1 mm [5-6 whorls], (42 specimens) (fig'd herein)
Shape	subovoid, thin similar to <i>F. angulatus</i> but with 6 whorls	subovoid, thin, spire sub-acute, 4 whorls	similar to <i>F. angulatus</i>	subovoid, thin, spire elongate
Protoconch	3 brown whorls, 2 whorls on smaller syntype, 3 on larger (Keen, 1968); slanted to the body whorl (Carpenter, 1857); syntype figure with cancellate nucleus	syntype almost disintegrated (Keen, 1968); original description states 2 nuclear whorls, tilted to left, no color given	2 whorls, dark brown, cancellate as in <i>F. tuberosus</i> , 2 strong revolving ribs on nucleus; no tilting of the nucleus to the left mentioned or obvious on type figure in Palmer (1963)	3 ⁺ brown, cancellate whorls, tilted to left, elongate
Whorls & sculpture	6 whorls, 2 or more keels on body whorl with fine spirals between, irregular minor lirae (Carpenter, 1857); 4 carinae on body whorl and fine spiral intercalary ribs (Keen, 1968)	4 whorls, about 6 angular keels, prominence of angular keels differing on each; Keen (1968) noted 2 carinae on body whorl	number of whorls not given in original description; 2 strong revolving ribs on penultimate whorl, body whorl enlarged with four strong widely spaced, revolving ribs, greatly acute with microscopic cross lines between the ribs; interstitial lines subobsolete & decussate basally (Palmer, 1963); whole surface minutely, spirally striate; basal carinae subobsoletely interstitially decussate (Carpenter, 1857)	5-6 whorls including protoconch, 2-4 carinae, varying within lots with fine intercalary spirals intersected by minute axial lines; prominence of keels differing on each; size of specimen and number of keels do not correlate
Periostracum and pattern	sometimes hairy periostracum	no periostracum mentioned	no periostracum mentioned	tan periostracum on some specimens, with hairs on the keels
Umbilicus	size and height variable, in the spreading form very large, in "compact state, very small"	large and acutely carinate	wide, large, carinate, forward	large, deep, defined by a carina
Aperture	lip excavated; syntype figure shows large callus on columella	lip thin, angulate, peritreme continuous, lip scarcely excavated, not at all plicate; no trace of callosity on columellar lip; Keen (1968) notes wide columellar lip, large aperture with thickened rim	broadly or widely semilunate, outer lip strongly carinate, greatly indented; inner lip straight, narrow	outer lip thin, reflecting keels, peritreme continuous, large callus on columellar lip; aperture D-shaped
Exterior color	blackish-white, nucleus brown	purple-colored, irregularly spotted, nucleus brown	all white but for brown protoconch	all specimens white, some with tan periostracum, nucleus brown
Operculum	none mentioned	none mentioned	brown, paucispiral, minutely rugose, nucleus anterior	light brown, paucispiral, nucleus anterior

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THE FIRST RECORD OF *ASPELLA PYRAMIDALIS* (BRODERIP, 1833) (GASTROPODA: MURICIDAE) FROM BAJA CALIFORNIA SUR, MEXICO

GIJS C. KRONENBERG

c/o Milieu Educatie Centrum, PO Box 435, NL-5600 AK Eindhoven, the Netherlands

When Keen (1971) published the second edition of her great work on the Panamic faunal province, the muricid gastropod *Aspella pyramidalis* (Broderip, 1833) was known from Mazatlán, Sinaloa, Mexico to Panamá and the Islas Galápagos (Keen:527). Since that time, some extensions of the known distribution were published, both southward to Colombia (Radwin & D'Attilio, 1976; Cosel, 1984 (fide Skoglund, 1992:69)) and northward to Bahía San Carlos, Sonora, Mexico (Poorman & Poorman, 1988:58).

While diving off Punta Concepción, east of Mulegé, Baja California Sur, Mexico, on 21 June 1995, I found one specimen of this species at 8 meters, under a rock. The specimen measures 13.4 mm long. This record extends the known distribution of *Aspella pyramidalis* to the Baja peninsula. This specimen is in my collection (no. 5005).

I would like to thank Mr. Roland Houart from Landen, Belgium, for identifying the specimen, and Mr. Ron P.A. Voskuil from Delft, the Netherlands for photography.

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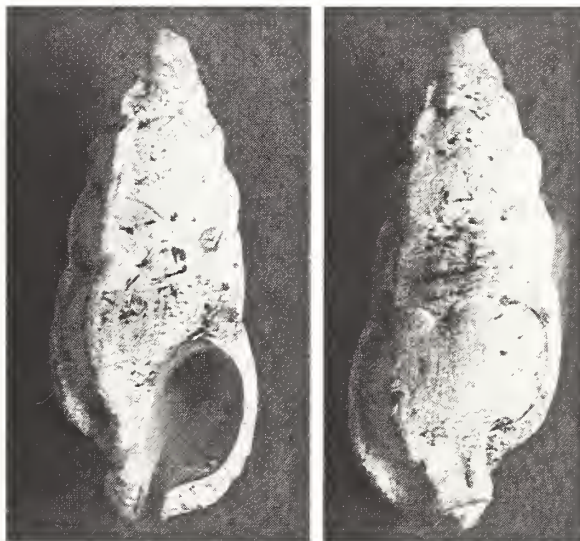


Figure 1. *Aspella pyramidalis*, apertural and dorsal views of specimen 13.4 mm L, Punta Concepción, Baja California Sur, Mexico, 21 June, 1995. Leg. G. C. Kronenberg.

BOOK NEWS

FIELD GUIDE TO THE GEODUCK: the secret life of the world's biggest burrowing clam from Northern California to Southeast Alaska.

By: David George Gordon. 1996.

Publisher: Sasquatch Books (Seattle).

48 pages, illus.

Price: \$6.95, paper.

"According to the Suquamish tribe of Washington State, clams have been great gossips since long ago. To silence their incessant chattering and restore peace to the wilderness, the other animals in the Pacific Northwest decided to bury the pesky mollusks on a beach. Today, whenever you walk along the seashore at low tide, you'll see water shooting up from the sand. These spurts come from deeply buried clams, striving to rid themselves of all the silt and seawater they swallow while continuing to gossip. Judging by the sizable spout from this giant bivalve - the largest burrowing clam in the world - the geoduck must have been quite the blabbermouth in its younger days." Thus begins the **Field Guide to the Geoduck**.

Author David George Gordon has put together another valuable addition to this series on the natural history of Pacific Northwest animals published by Sasquatch Books of Seattle. Free-lance writer Gordon, who lives in Port Townsend, has previously authored four other field guides in the series, including the interesting and whimsical **Field Guide to the Slug**. The series is dedicated to various non-profit environmental organizations in the Northwest. Royalties from the slug book benefit the Western Society of Malacologists and proceeds from the geoduck book will go to People for Puget Sound, a watch-dog agency that monitors pollution.

The book begins with the geoduck family tree, describing its place among the mollusks and goes on to

explain the etymology of its name, including the many various spellings of both its common and scientific names and their origins. Internal and external anatomy ("it looks like something you won't see on TV") are covered in moderate detail along with its life cycle, predators and companions (its "boring relatives"!). There is also quite a good history of geoduck gathering, the problem of over-fishing in the 1920s and 30s and the current commercial harvest of today.

The first commercial catch of subtidal geoducks began in Washington State in 1970 and quickly grew and spread to other states and British Columbia. The current harvest is strictly regulated and brings in about \$20 million a year to Washington just in leases of geoduck tracts. This money goes to aquatic lands enhancement, geoduck research projects and replenishment of the stocks. It is one of the best regulated reapings of wild stocks, maintained on a sustainable yield basis. Live geoducks sold for sushi bring as high as \$20 per pound in seafood markets, but most are exported nowadays to Asian markets.

This book will be a valuable and reasonably-priced addition to the library of any malacologist or conchologist interested in West Coast bivalves. Shell collectors, beachcombers and seafood hunters alike will all enjoy Gordon's clever, pithy humor and the interesting information on this noble clam.

Roland C. Anderson

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THE FESTIVUS

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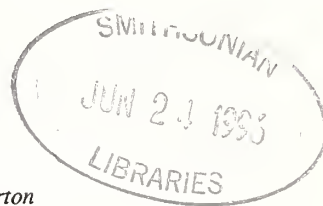
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The **Festivus** is published monthly except December. The publication date appears on the masthead above. Single copies of this issue: \$5.00 plus postage.

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park



PROGRAM

Octopus veligero: a Vacationing Tourist or a Permanent Resident

Megan Lilly, a marine biologist with the City of San Diego's Ocean Monitoring Program, will give an

illustrated presentation on *Octopus veligero* and *Octopus* species of the Southern California Bight.

Also

Club winner in the 1996 Greater San Diego Science and Engineering Fair, Gerard James Rymer, a senior at Gompers Secondary School, will present an overview

of his winning project, "*Stronglyocentrotus purpuratus*: chemotactic response to *Macrocyctis pyrifora* extracts." and receive his Club award.

Meeting date: 20 June 1996
Shells of the month: Southern California shells

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CLUB NEWS

From the Minutes of the Meeting of the San Diego Shell Club, 16 May 1996

Bill Romer called the meeting to order at 7:40 p.m. The minutes of the March meeting were accepted as published in *The Festivus*. Bill informed everyone that the Auction had been a great success. Everyone who attended had a great time.

The Bizarre Bazaar will be held on August 4th from 1:00 to about 5:00 p.m. at the home of the Bradners.

The September Party will be on September 21st at the home of the Arnolds. The party's theme is "Come as your favorite person." Attendees are asked to bring their favorite dish or make a \$5.00 contribution.

The Christmas Party on December 14th will be held in the same location as last year and will include the same choices of meals (chicken or pork) at the prices paid last year.

Terry Arnold has a web page dedicated to Club information. The address is printed below.
<http://www.users.cts.com/crash/t/tarnold/WSMPage.html>

Bill introduced the speaker of the evening, Hans Bertsch. Hans informed the group that students from one of his classes were present and they were welcomed by the members. Hans spoke on the region of Bahía de Los Angeles. He told of the rain shadow effect which causes the area to the west of the mountains in Baja California to receive rain, whereas the eastern side of the mountains is dry and barren. Though the land is barren, there is a wealth of life below the sea. He identified three areas each hosting differing kinds of sea life: the sandy area in the bay, the shallow rocky area, and the deeper island area. After three years of data collection, he found that as temperatures decreased in the winter in the region, the number of species increased. It was a wonderfully informative presentation.

The drawing winner was one of Hans' students, Eric Saxton. The meeting was adjourned at 9:00 p.m. for everyone to enjoy the refreshments provided by Silvana Vollero, Kent Trego and Bill Romer. Everyone enjoyed looking at the Olive specimens from the Gulf of California.

Silvana Vollero

New Laws on the Collecting of Abalone

According to new regulations, only the red abalone (*Haliotis rufescens*) may be taken by either commercial or recreational collectors. The harvesting of green, pink and white abalone will be strictly prohibited for the next two years and the collecting of black abalone has been banned since 1993.

For further information, consult the latest Department of Fish and Game regulations booklet.

The WSM in San Diego

The 29th annual meeting of the Western Society of Malacologists will be held at the Handlery Hotel and Resort from 23-27 June. The Club will host a welcoming wine and cheese reception.

There will be three symposia [see March issue] as well as contributed papers and poster presentations. In addition to the scientific program there will be field trips, an auction and book/reprint sale to support student grants, evening slide shows, shell displays and a banquet.

For further information, contact President Hugh Bradner (619) 459-7681; FAX (610) 459-0657 or e-mail: hbradner@ucsd.edu.

It is hoped that many Club members will attend.

Club T-shirts on Sale

Now that summer is almost upon us, it will be a perfect time to replenish your t-shirt supply. The Club's brightly printed t-shirts will be on sale at the June meeting at the very low price of \$10.00 each.

Don't miss this opportunity to get a Club t-shirt at a bargain price. Also available for sale are the beautifully designed Club mugs.

Addition to the Roster

Hayes, Brian, P.O. Box 804, Port Elizabeth 6000, South Africa. Tel/FAX (041) 334521.

DREDGING AROUND ISLA DANZANTE, GULF OF CALIFORNIA, MEXICO, OR WHAT YOU FIND AT THE END OF A LINE

MARGARET MULLINER

5283 Vickie Dr., San Diego, CA 92109, USA

Since 1985, my husband Dave and I have been dredging around Isla Danzante, the small island just southwest of Isla Carmen, in the Gulf of California. We have returned to this area each year from late September through October. Although most of our collecting has been done by small dredge, Dave has also collected specimens by scuba diving. The results of our ten year survey of this region has yielded range extensions, both geographic and bathymetric, as well as examples of interesting and beautiful species.

The species listed below in Table 1 are all in the Mulliner collection. The taxonomic arrangement is by Keen (1971) as modified by Vaught (1989) and Skoglund (1992). Numbers from Keen (1971) are used where possible. Identifications of material were confirmed by Carol Skoglund of Phoenix, Arizona. All material was collected dead unless otherwise noted.

In the table, a circle [●] next to a Keen number indicates a new depth record. (Where possible, previously reported depth records are noted.) When these specimens were collected dead, it is understood that they may have been washed to these lower depths. An asterisk [*] indicates a range extension. In the "Remarks" are listed previous distributional records and other pertinent information.

I wish to thank Carol Skoglund for help in identifying the species, Dave Mulliner for the photography and Carole Hertz for help in setting up the paper and for her patience.

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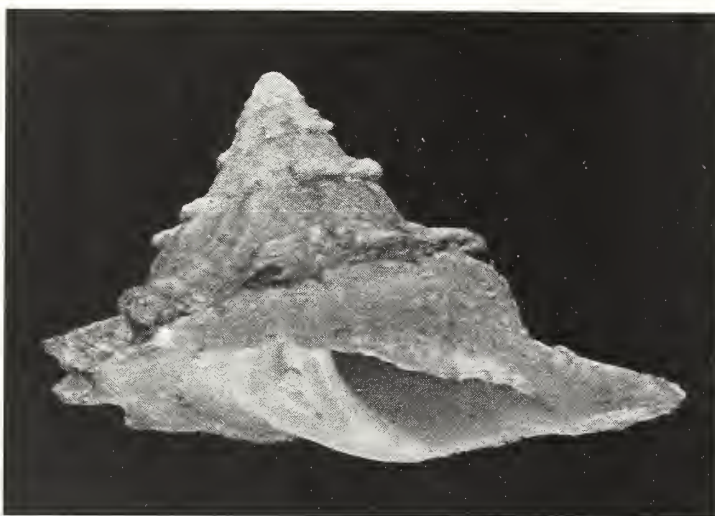
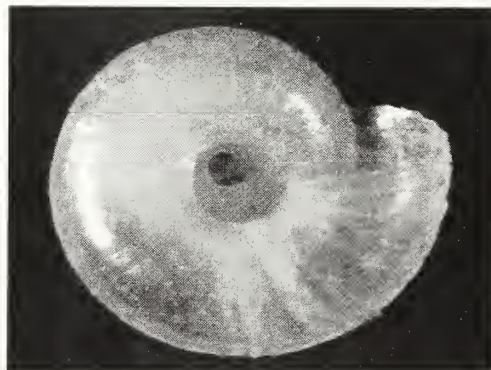


Figure 1, 4 (l, r). (1) *Astraea unguis* (Wood, 1828), profile view of specimen 12.5 x 23.0 mm. Dredged off Isla Danzante in 45-55 m in sand, and rubble, 1992. (4) *Nitidiscala arcana* (DuShane, 1979), 8.3 x 3.1 mm, dredged in 50-60 m off Isla Danzante, 1992. Photos: D. K. Mulliner.



Figures 2, 3 (l, r). *Episcynia bolivari* Pilsbry & Olsson, 1946, (2) profile view (3) basal view of specimen 1.5 x 2.1 mm. Dredged off Isla Danzante, 1993. Photos: D. K. Mulliner.

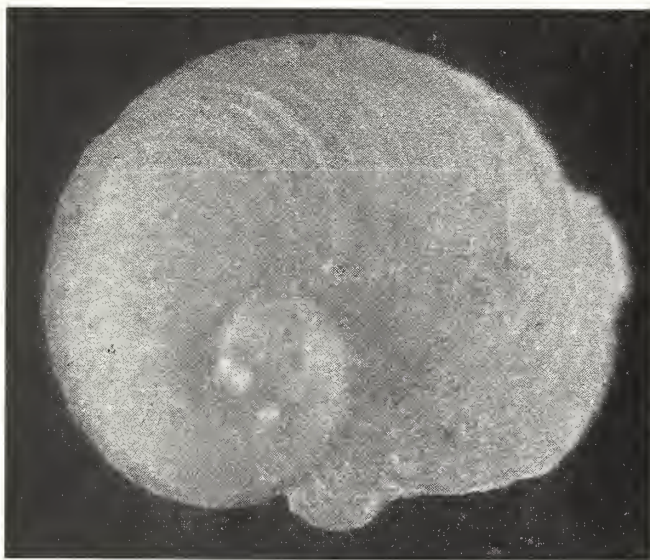
Table 1. New Molluscan Distributional and Bathymetric Records
 [● = depth; * = range]

Keen Number	Species	Depth	Remarks
BIVALVIA			
●271	<i>Here excavata</i> (Carpenter, 1857)	135 m	9 valves, 1991. In depths to 110 m (Keen, 1971).
●340	<i>Pythinella sublaevis</i> (Carpenter, 1857)	135 m	1 valve, 1993. In depths to 35 m (Poorman & Poorman, 1988).
●369	<i>Trigoniocardia granifera</i> (Broderip & Sowerby, 1829)	50-60 m	5 specimens, 1991. Intertidally to 25 m (Keen, 1971).
*552	<i>Tellina zaca</i> Hertlein & Strong, 1949	120-135 m	16 valves, 1992-1993. First record off Isla Danzante. Previous known distribution: SW part of Gulf of California in 64-165 m (Keen, 1971).
●581	<i>Tellidora burneti</i> (Broderip & Sowerby, 1829)	35-50 m	2 specimens, 1992. In depths to 29 m (Keen, 1971).
*699	<i>Panopea globosa</i> Dall, 1898	135 m	Only 1 valve collected (147.0 mm L), 1992. First record off Isla Danzante. Previous known distribution: head of the Gulf of California to Isla San Marcos (Keen, 1971).
GASTROPODA			
●122	<i>Parviturbo conceptionensis</i> (Lowe, 1935)	50-60 m	1 specimen, 1992. In 15 to 35 m (Keen, 1971).
●124	<i>Parviturbo stearnsii</i> (Dall, 1918)	50-60 m	7 specimens, 1993. In 3 to 30 m (Keen, 1971).
*157	<i>Astraea unguis</i> (Wood, 1828) (Figure 1)	45-55 m	4 juvenile specimens, off W side of Isla Danzante, in sand and rubble, 1992. Previous known distribution: Guaymas, Sonora to Acapulco, Guerrero, Mexico & Santa Elena, Ecuador (Keen, 1971).
●169	<i>Plesiothyreus malonei</i> (Vanatta, 1912)	50-65 m	1 specimen, 1992.
*---	<i>Cochliolepis cornis</i> Hertz, Myers & Gemmell, 1992	50-60 m	3 specimens, 1992. Previous known distribution: San Felipe, S to Puertecitos, Baja California (Hertz, Myers & Gemmell, 1992); Estero Morua, Sonora and Playa Novillero, Nayarit; off Requeson, Bahía Concepción, Baja California Sur, Mexico (Skoglund & Koch, 1995).
*350	<i>Alleorus deprellus</i> (Strong, 1938)	50-60 m	1 specimen, 1993. First report off Isla Danzante. Previous known distribution: Isla San Jose, (S of Isla Danzante) (Strong, 1938); Estero Morua, Sonora, México to Costa Rica (Draper, 1974a); Puertecitos, Baja California, México (Hertz, Myers & Gemmell, 1992).
●351	<i>Episcynia bolivari</i> Pilsbry & Olsson, 1946 (Figures 2, 3).	50-60 m	7 specimens, dredged off Isla Danzante, 1993.
●385	<i>Solariorbis liriopae</i> (Bartsch, 1911)	50-60 m	5 specimens, 1993.
●419	<i>Anticlimax occidens</i> Pilsbry & Olsson, 1952	50-60 m	2 specimens, 1993. In 37 m (Draper, 1974b).
●555	<i>Metaxia convexa</i> (Carpenter, 1857)	35-50 m	7 specimens, 1992.

●624	<i>Asperiscala macleani</i> (DuShane, 1970)	50-60 m	1 specimen, 1992. In 27 to 45 m (DuShane, 1974).
●636	<i>Hirtoscala reflexa</i> (Carpenter, 1856)	50-60 m	7 specimens, 1993. In 11 m (DuShane, 1974).
●637	<i>Hirtoscala replicata</i> (Sowerby, 1844)	135 m	1 specimen collected live and 12+ dead, by dredging off Isla Danzante, 1993. In 5 to 25 m (DuShane, 1974).
*640	<i>Nitidiscala arcana</i> (DuShane, 1979) (Figure 4)	50-60 m	1 specimen, 1992. First record off Isla Danzante. Previous known distribution, as: <i>Epitonium barbarinum</i> Dall, 1919, southern California and northern Gulf of California (Keen, 1971); San Felipe to Puertecitos on W side of Gulf; from Puerto Peñasco S to Cabo Tepoca, Sonora, México, intertidally to 18 m (DuShane, 1979).
*707	<i>Eulima townsendi</i> (Bartsch, 1917)	50-60 m	12 specimens, 1992-1993. First record off Isla Danzante. Previous known distribution: La Paz, Baja California Sur, Mexico (Keen, 1971); Manabí Province, Ecuador (Shasky, 1984).
*---	<i>Macromphalina carinata</i> (Pilsbry & Olsson, 1945) (Figures 5, 6)	50-60 m	2 specimens, 1993. First record off Isla Danzante. Previous known distribution: Punta Callo, Ecuador (Pilsbry & Olsson, 1945); across Gulf from Estero Morua, Sonora, Mexico (Skoglund & Koch, 1995).
*798	<i>Vanikoro galapagana</i> Hertlein & Strong, 1959 (Figure 7)	45-55 m	2 specimens, 1992. First report off Isla Danzante. Previous known distribution: Galápagos (Keen, 1971).
*●864	<i>Natica idiopoma</i> Pilsbry & Lowe, 1932	90-135 m	1 live specimen, 1992. First report off Isla Danzante. Previous known distribution: Galápagos & San Juan del Sur, Nicaragua (Keen, 1971); southern Gulf of California to Colombia & Islas Galápagos in depths of 4 to 61 m (Marincovich, 1977); Isla Gorgona, Colombia (Cosel, 1984); Isla del Coco, Costa Rica (Shasky, 1989); Islas Revillagigedo (Emerson, 1995).
●867	<i>Natica sigillata</i> McLean, 1970 (Figures 8,9)	100-120 m	1 specimen (record size, 27.0 x 18.0 mm), 1992. Dredged, NE side of Isla Danzante. In depths to 91 m (Marincovich, 1977).
●988	<i>Murexiella humilis</i> (Broderip, 1833)	50-60 m	2 specimens, 1993. Intertidally and offshore in 15-33 m (Keen, 1971).
*●1006	<i>Muricopsis pauxillus</i> (A. Adams, 1854)	50-60 m	3 specimens, 1993. First record off Isla Danzante. Previous known range: southern Gulf of California near Mazatlán, Sinaloa (Keen, 1971). Intertidal to 13 m (Radwin & D'Attilio, 1976).
●---	<i>Aspella pollux</i> Radwin & D'Attilio, 1976 (Figure 10)	100-120 m	7 specimens (one live collected), 1992, off NE point of Isla Danzante. Previously recorded from S end of Gulf of California to Costa Rica (Radwin & D'Attilio, 1976); Isla del Coco, Costa Rica (Montoya, 1983); Manabí, Ecuador (Shasky, 1984); off Bahía San Carlos, Sonora, Mexico in 100 m (Poorman & Poorman, 1988); Islas Galápagos, Ecuador (Shasky, 1989).
●1020	<i>Bizetiella carmen</i> (Lowe, 1935)	50-60 m	5 specimens, 1992. In 15-40 m (Keen, 1971).
●1051	<i>Typhisopsis coronatus</i> (Broderip, 1833)	50-60 m	3 specimens, 1992. Offshore in depths to 33 m (Keen, 1971).

●1063	<i>Babelomurex costata</i> (Blainville, 1832)	50-60 m	1 specimen, 1992. Intertidally and offshore (Keen, 1971).
●1065	<i>Coralliophila orcuttiana</i> Dall, 1919	135 m	1 specimen, 1991. In depths to 95 m (Keen, 1971).
●1066	<i>Coralliophila parva</i> (E.A. Smith, 1877)	50-60 m	2 specimens. Usually an intertidal species.
*1093	<i>Trachypollia lugubris</i> (C.B. Adams, 1852) (Figure 11)	45-55 m	1 specimen, 1990. First report off Isla Danzante. Previously reported from San Diego, California to Panama (Keen, 1971); Manabí Province, Ecuador (Shasky, 1984).
●1124	<i>Engina solida</i> (Dall, 1917)	50-60 m	1 specimen, 1992.
●1125	<i>Engina jugosa</i> (C.B. Adams, 1852)	50-60 m	2 specimens, 1992. Previously reported to 37 m (Keen, 1971).
*1131	<i>Macron aethiops</i> (Reeve, 1847) (Figure 12)	15-21 m	1 specimen, December 1978, taken by SCUBA by D.K. Mulliner. Like form <i>kellettii</i> A. Adams, 1854. First record off Isla Danzante. Previous known distribution: Playa San Ramón, Pacific coast of Baja California to 10 miles N of Cabo San Lucas, B.C.S., Mexico (DuShane, 1989).
●1133	<i>Metula amosi</i> Vanatta, 1913	100-135 m	1 specimen, 1993. In depths to 18 m (Keen, 1971).
●1421	<i>Mitra swainsoni</i> Broderip, 1836	175 m	1 specimen, live collected, off Isla Danzante, 1993. Previous known distribution: Guaymas, Sonora, Mexico to Ecuador in 5 to 73 m (Keen, 1971); Tumbes, Perú (Peña G., 1970).
*1476	<i>Sveltia centrota</i> (Dall, 1896) (Figure 13)	175 m	1 specimen live, 1 dead, 1991. First record off NE side of Isla Danzante. Previous known distribution: Gorda Banks, Baja California Sur, Mexico to Isla del Coco, Costa Rica (Keen, 1971); Bahía San Carlos, Sonora, Mexico (Poorman & Poorman, 1988).
●972	<i>Tritonoharpa siphonata</i> (Reeve, 1844)	50-60 m	1 specimen, 1992. In depths to 55 m (Beu & Maxwell, 1987).
●1506	<i>Conus emarginatus</i> Reeve, 1844	175 m	4 live collected specimens, off Isla Danzante, 1993. Previous known distribution: [as <i>C. recurvus</i>] Bahía Magdalena and the Gulf of California to Colombia, in 35 to 145 m (Keen, 1971).
*●---	<i>Conus xanthicus</i> Dall, 1910 (Figure 14)	162 m	3 specimens collected live, NE Isla Danzante, October 1993. First Baja California record. Previous known distribution: Morro Colorado, Sonora, Mexico to Colombia; Islas Revillagigedo, Mexico, Islas Galápagos, Ecuador, 50 to 140 m (McLean & Nybakken, 1979).
●1516	<i>Conus tornatus</i> Sowerby, 1833	50-60 m	2 specimens, 1990. Offshore in less than 37 m (Keen, 1971); intertidal at Panama (Shasky, 1975).
*1521a	<i>Terebra argosyia</i> Olsson, 1971 (Figure 15)	50 m	2 specimens, 1990. First record off Isla Danzante. Previous known distribution: Isla La Plata, Ecuador (Keen, 1971); Islas Cébaco & Gubernadora, Panamá (Bratcher, 1991); Guaymas, Sonora, Mexico to Ecuador (Koch, 1992).
●1576a	<i>Tiariturris spectabilis</i> Berry, 1958	135-150 m	1 specimen, collected live off Isla Danzante, 1993. In 35 to 90 m (Keen, 1971).

●1577	<i>Calliclava aegina</i> (Dall, 1919)	50 m	4 specimens, 1990. In 15 to 30 m (Keen, 1971).
*1590	<i>Elaeocyma ricaudae</i> Berry, 1969 (Figure 16)	100-120 m	1 specimen, 1992. First report off Isla Danzante. Previous known distribution: Outer coast of Baja California, Pta. Abrejos to Boca Soledad (Keen, 1971); Bahía Pulmo, Baja California Sur to Salina Cruz, Oaxaca, Mexico (Anon, 1970).
●1615	<i>Drillia acapulcana</i> (Lowe, 1935)	135 m	2 specimens, 1992. In 20 to 60 m (Keen, 1971).
●1656	<i>Knefastia dalli</i> Bartsch, 1944	50-60 m	1 specimen, live collected, 1993. At low tide and just offshore (Keen, 1971).
●1663	<i>Pyrgospira obeliscus</i> (Reeve, 1843)	50 m	1 specimen, 1990. In 40 m (Keen, 1971).
●1685	<i>Crassispira discors</i> (Sowerby, 1834)	50 m	2 specimens, 1990. From low tide to 25 m (Keen, 1971).
●1723	<i>Carinodrillia dichroa</i> Pilsbry & Lowe, 1932	50 m	1 specimen, 1990. In 10 to 40 m (Keen, 1971).
*1797	<i>Tenaturris concinna</i> (C.B. Adams, 1852)	50-60 m	6 dredged specimens, 1993. First report off Isla Danzante. Previous known distribution: Islas Tres Marias, Mexico to Bahía Santa Elena, Ecuador (Keen, 1971).
●1798	<i>Tenaturris merita</i> (Hinds, 1843)	50-60 m	1 specimen, 1992. Intertidally to 10 m (Keen, 1971).
●1837	<i>Daphnella bartschi</i> Dall, 1919	50-60 m	1 specimen, 1993. In depths to 20 m (Keen, 1971).
*●1889	<i>Pyramidella linearum</i> Pilsbry & Lowe, 1932 (Figure 17)	50-60 m	2 specimens, 1993. First report on Baja side of Gulf of California, off Isla Danzante. Previous known distribution: Puerto Peñasco, Sonora to Acapulco, Guerrero, Mexico, in depths to 37 m (Keen, 1971).
●2021	<i>Peristichia pedroana</i> (Dall & Bartsch, 1909)	50-60 m	2 specimens, 1992. Original description: 2-12 fm (4-22 m).



Figures 5, 6 (l, r). *Macromphalina carinata* (Pilsbry & Olsson, 1945), (7) spire view (8) basal view of specimens 2.1 mm max. diam. Dredged in 50-60 m off Isla Danzante, 1992. Photos: D. K. Mulliner.

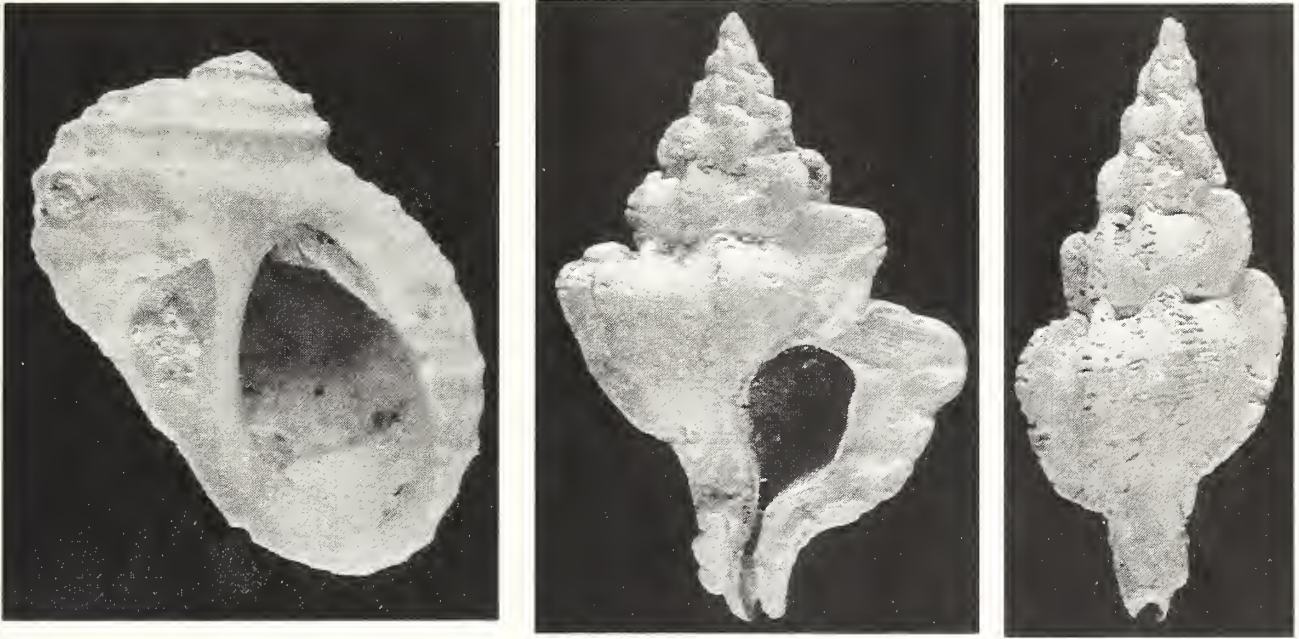
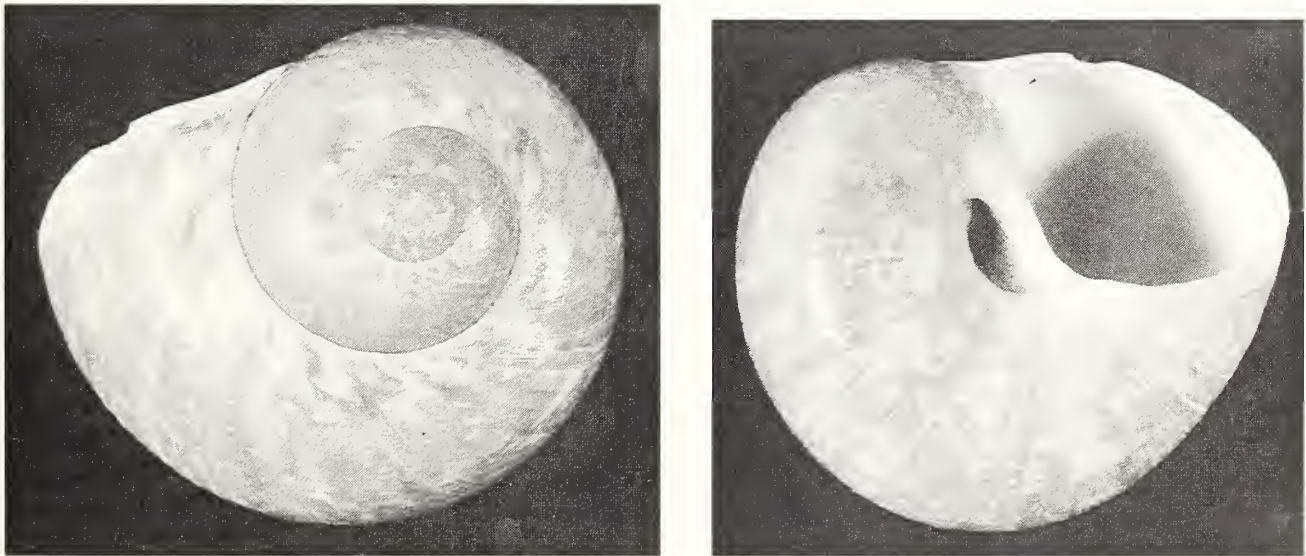
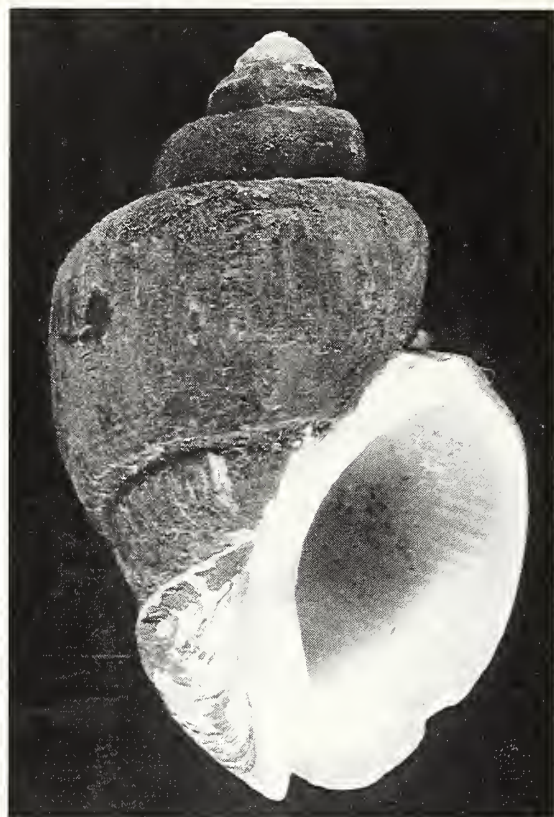


Figure 7, 10 (l, r). (7) *Vanikoro galapagana* Hertlein & Strong, 1959, 3.1 x 4.1 mm specimen dredged off Isla Danzante in 45-55 m, 1992. (10) *Aspella pollux* Radwin & D'Attilio, 1976, apertural view of 15.7 mm specimen and dorsal view of 25 mm specimen. Dredged in 100-120 m off Isla Danzante, 1992. Photos: D. K. Mulliner.



Figures 8, 9 (l, r). *Natica sigillata* McLean, 1970, (8) spire view (9) basal view of record size specimen 27.0 x 18.0 mm, dredged off Isla Danzante, 1992. Photos: D. K. Mulliner.



Figures 11, 12 (l, r). (11) *Trachypollia lugubris* (C. B. Adams, 1852), apertural view of 17.7 mm specimen. Dredged in 50-60 m off Isla Danzante. (12) *Macron aethiops* (Reeve, 1847), apertural view of 45.8 mm specimen. Taken by SCUBA by D. K. Mulliner, in 15-21 m off Isla Danzante, 1978. Photos: D. K. Mulliner.

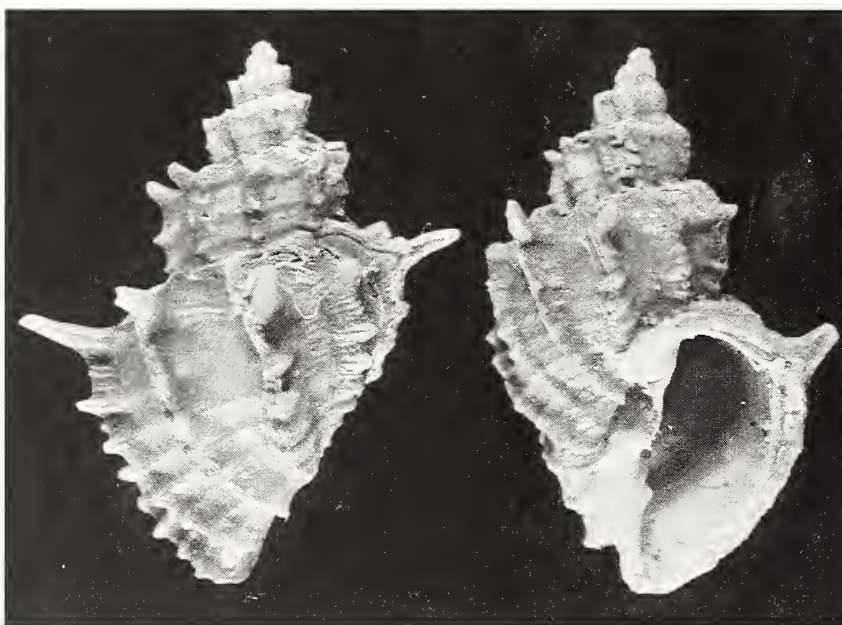
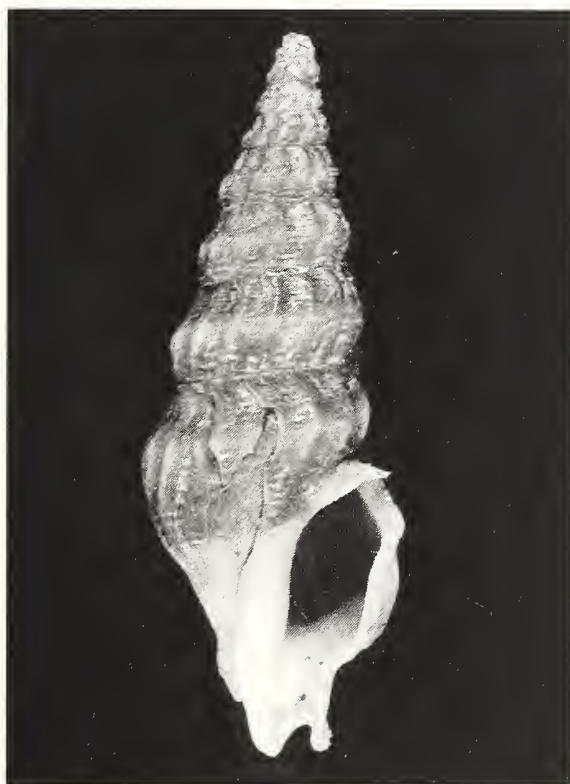


Figure 13. *Sveltia centrota* (Dall, 1896), dorsal view of 24.1 mm live collected specimen and apertural view of 25.0 mm dead collected specimen. Dredged in 175 m off Isla Danzante, 1991. Photo: D. K. Mulliner.



Figure 14, 15 (l, r). (14) *Conus xanthicus* Dall, 1910, apertural view of 42.5 mm live collected specimen and dorsal view of 40.7 mm live collected specimen. Dredged off Isla Danzante in 162 m, 1993. (15) *Terebra argosia* Olsson, 1971, apertural view of 27.9 mm specimen. Dredged in 50 m off Isla Danzante, 1990. Photos: D. K. Mulliner.



Figures 16, 17 (l, r). (16) *Elaeocyma ricaudae* Berry, 1969, apertural view of 43.0 mm specimen. Dredged in 100-120 m off Isla Danzante, 1992. (17) *Pyramidella linearum* Pilsbry & Lowe, 1932, apertural view of 13.5 mm specimen. Dredged in 50-60 m off Isla Danzante, 1993. Photos: D. K. Mulliner.

BOOK NEWS

Monographs on Galapagos Mollusca, Marine Molluscs of the Galapagos, Gastropods, No. 1 and No. 2
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These volumes are major additions to the systematic literature on mollusks of the Galapagos Islands and on tropical eastern Pacific mollusks in general. The format is large, 8.5 x 12 inches. The volumes are hard bound with glossy paper finish and color photos on the front covers. Each of the treated species is lavishly illustrated with numerous views of several specimens; in most cases a single species is illustrated on each plate. Plates are positioned to follow the text on each family. Finet's color photography is superb, as is the printing quality. For the second volume, some of the species of small size are illustrated with SEM views in addition to the color photos. SEM views of the radula of *Fissurella obscura* are provided in the first volume and for *Calliostoma leanum* and *Nerita scabricosta* in the second volume.

The text for each species includes a full synonymy with references, and headings for: Type material and type locality, Original description (giving copies of original descriptions for both the nominate form and synonyms), and Distribution and material examined (giving catalog numbers and detailed localities from museum labels), and Remarks (which are not given for all species). Keys to the families, genera, and species are provided. Finet's work is based on examination of specimens in most of the major U.S. museums.

Color illustrations and synonymies are also provided for species that have erroneously been recorded from the Galapagos Islands, which makes this work valuable for studies outside of the region.

Each volume repeats the same brief text and figures that show the ocean currents that affect the distribution of mollusks at the Galapagos Islands. Six half-page color photos showing shoreline habitats are included in the introduction to each volume; four of the same photos are used in each volume.

The Table of Contents shows the classification to the generic level and indicates the inclusive number of plates devoted to each family. It does not give the species, which can only be determined by perusing the text. However, the total numbers of species treated are mentioned in the Foreward section to each volume. For the first volume 32 species are discussed, of which 18 occur at the Galapagos Islands; a total of 144 specimens are figured. For the second volume 31 species are discussed, of which 20 occur at the Galapagos Islands; a total of 108 specimens are figured.

The classification is current and follows that outlined in Finet's latest checklist of Galapagos mollusks: *Marine Mollusks of the Galapagos Islands*, a documented faunal list, 1994, 180 pp., published by the Museum d'Histoire Naturelle de Genève, at which institution Dr. Finet is the Curator of Mollusks.

The price of these volumes is comparable to that of other recent books on mollusks produced by the same publisher. The cost of publication was met with partial subsidies from sources that were acknowledged in each volume.

James H. McLean

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Terrence M. Gosliner
<i>California Academy of Sciences</i>
James H. McLean
<i>Los Angeles County Museum of Natural History</i>
Barry Roth
<i>Research Associate</i>
<i>Santa Barbara Museum of Natural History</i>
Paul Scott
<i>Santa Barbara Museum of Natural History</i>
Emily H. Vokes
<i>Tulane University</i>

Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

PROGRAM

Denizens of the Shallows:

Different Perspectives on Mollusks Inhabiting Coral Reefs of the Indo-Pacific

Terrence Gosliner, of the California Academy of Sciences, will present an illustrated talk on the diversity of species inhabiting the world's largest biogeographic realm. His talk will explore some aspects of the

diversity and biology of the well known coral reef mollusks as well as many which are less known, but equally intriguing in their adaptations to their environment.

Meeting date: 18 July 1996

Shells of the month: Coral reef shells

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CLUB NEWS

From the Minutes of the Meeting of the San Diego Shell Club, 20 June 1996

President Bill Romer called the meeting to order at 7:45 p.m. The minutes of the May meeting were accepted as published in **The Festivus**. Bill reminded everyone of upcoming events and apologized for forgetting to announce George Hanselman's flyers at the last meeting regarding his sale of plastic boxes. The flyers, with a detailed price list according to box size, were displayed at the June meeting. Anyone who is interested in purchasing the boxes can call George directly.

Treasurer Margaret Mulliner reported that the Club made a \$500 donation to the WSM student grant fund. On behalf of the WSM, president Hugh Bradner thanked the Club.

The WSM meeting will open on Sunday with a wine and cheese welcome party hosted by the Club from 7-9:00 p.m. in the hospitality room at the Handlery Hotel in Hotel Circle. There will be an auction on Tuesday evening and a banquet on Wednesday. All proceeds from the auction will go to support the the student grant fund.

John Jackson introduced a new book by Terry Gosliner on coral reef invertebrates of the Indo-Pacific. It will be available in August but early orders by Club members will be at a reduced price. **The Festivus** will receive a review copy of this book.

Bill introduced the speaker of the evening, Megan Lilly. Megan is a marine biologist for the City of San Diego. Her lab conducts environmental assessments of sewage outfall among other related matters. The audience was most interested in her work and Megan spoke briefly about some of the environmental concerns handled by her office.

Megan is especially interested in Octopus and the subject of her talk was "*Octopus veligero*: a vacationing tourist or a permanent resident." She showed slides of this tiny animal and of the various other octopus species that are found in this region, the largest being *Octopus californicus* and *Octopus rubescens*, an uncommon species in the area which displays a variety of color patterns. The life span for the octopus is from one to two years. If those present were not interested in these fascinating creatures prior to this presentation, they

certainly were afterwards.

The winner of the door prize was Margaret Mulliner. Refreshments contributed by Kay Klaus and Margaret Mulliner were enjoyed by all when the meeting adjourned for the social time.

Silvana Vollero

Volumes and Back Issues of The Veliger Available

A number of complete volumes of **The Veliger**, some out of print, as well as individual issues are available for sale. Complete volumes can be purchased for \$40 each and individual issues at \$10 each. Postage is included. (For overseas addresses, the issues will be sent surface mail).

Complete volumes: 9-14 and 23-28

Individual issues: 2(4); 8(4); 9(4); 13(1); 14(2)
28(1); 36(1); 37(1,2);
38(1,2,4) and 39(1).

For further information, call Carole Hertz (619) 277-6259 or Margaret Mulliner (619) 488-2701.

The Bizarre Bazaar at the Bradner's

The Bizarre Bazaar will be held on August 4th from 1:00 to 5:00 P.M. on the deck of the Bradner's home at 1867 Caminito Marzella, La Jolla.

For those who plan to attend, make sure to bring a table or stand to display your shells. It's always a casual, fun get-together with friends buying, trading, admiring and just plain visiting. Try to make it!

The September Party

The September Party will be held on Saturday evening September 21st at the home of Marty and Terry Arnold. The theme this year is "Come as Your Favorite Character" real or fictional. Attendees are asked to bring their favorite dishes (each to serve 12).

This is an early notice so that members can plan to come in attire suitable to their "favorite character." It's great fun to "dress up." Try it!!

A map to the Arnold residence will appear in the September issue.

THE SHELL GAME: MOLLUSKS SHELL DETERIORATION IN COLLECTIONS AND ITS PREVENTION

SALLY Y. SHELTON¹

Director, Collections Care and Conservation
San Diego Natural History Museum, P.O. Box 1390, San Diego, California, USA

Many of us think of collections storage as an essentially inert environment. We don't detect anything going on, so we assume that nothing is. This is, of course, not true. Collections storage can be a very hostile environment indeed. After the silverfish have made lace out of all your labels, acidic storage has crumbled them, humidity changes have split the thin shells and light has faded everything, you start to put some time and thought into the storage environment.

I define storage as everything that is not active handling. A collections case is storage. So is an exhibits case. So are the various envelopes, cigar boxes, film reel cans and other containers we all have worked with. A specimen will spend 95 to 100% of its time in collections storage, yet the selection and design of storage systems tend to be very casual, even haphazard.

Thomas Browne of Scotland was apparently the first to describe the deterioration of mollusk shell collections in 1839 in *A Conchologist's Text-Book*. He described the white, spotted or streaky surface marring of shells in collections cabinets but did not offer a solution to the problem. Since then, there have been a number of publications on the problems and possible solutions, the latter ranging from the sane to the utterly ridiculous.

Browne's book was promptly plagiarized for publication in the United States and published as *The Conchologist's First Book* under no less a name than Edgar Allen Poe. (This was apparently set up by colleagues of Poe hoping to take advantage of very different copyright laws and to use Poe's name as an attraction. Poe was evidently paid for the use of his name and was solely responsible for the introduction

and preface. The illustrations were copied from Browne; the whole thing is noticeably inferior to the original. Such a practice was not exactly illegal at the time; whether it is unethical is another discussion.)

The first serious publication on this form of shell degradation was done in 1896 by Agnes Kenyon who described the characteristic problem:

"While on a visit to Tasmania, I had the opportunity of visiting a collection on which the near vicinity of the sea had the effect of partially destroying the enamel of the dorsal surface, by streaks or clouds of a whitish or lime-like substance, the saline particles in the atmosphere evidently exerting a corrosive effect." Mrs. Kenyon was closer than she knew, and closer than anyone else would get for thirty years, to the true cause of the problem.

An alternative view was aired in 1899 by Loftus St. George Byne, M. Sc., in a presentation to the Conchological Society of Great Britain and Ireland. Mr. Byne, an amateur conchologist who had previously published on marine mollusc faunas, was asked to investigate the deterioration of shells in collections by J. Cosmo Melvill of the Society, who had noticed the deterioration of a *Mitra* shell. Melvill's preface to Byne's paper is the first time that this condition is described as a "disease" (Byne, 1899a:172).

"...I have seen too frequently in the almost hermetically-sealed drawers of the British Museum, a dulness first pervading the exterior of certain smooth species more markedly e.g. *Conus*, *Cypraea*, and especially *Naticidae*. Then grey acid efflorescence, both tasting and smelling strongly of vinegar covers the whole surface like a powder, rising doubtless from the interior, and the specimens are soon almost irretrievably ruined."

Byne took this challenge seriously and set out his conclusions in his very first page:

"The most remarkable facts are:-

1. Only marine species are attacked.

¹ Adapted from a presentation to the San Diego Shell Club, March 1996, with permission of the author.

2. Highly-polished shells, such as those of *Cypraea*, are the most likely to be affected.
3. It does not extend to every specimen in a drawer, and of several mounted on the same tablet, perhaps only one is attacked.
4. Loose shells are also destroyed, but there are comparatively few of these compared with the number of those mounted on cards.
5. The shells affected are from twenty to fifty years old, but the corrosion does not appear until after the lapse of about ten years. The process is thus an extremely slow one.
6. It occurs principally amongst the shells kept in drawers in the dark, where the air is confined and seldom changed.
7. If the tongue be placed against one of the shells, an astringent alum-like taste will be observed." (*Ibid*, p. 173).

Other than providing two examples of the Victorian scientist's tendency to use all senses in exploring problems, these conclusions are mostly notable for two things: Most are largely either wrong or misleading and they persist in the literature today in spite of published work modifying or disproving them.

Byne eliminated high humidity as a cause of the problem because he was assured that the Natural History Museum was "excessively dry," and excluded damp as a cause without further comment. He did recommend the use of turpentine to kill fungal attacks. He considered the effect of sulfuric compounds in the atmosphere, but rejected that when he could not find calcium sulphate. (He did not test the air, but relied on figures from a paper published five years earlier.) He considered the effect of salt remaining in marine shells that had not been soaked in fresh water, but did not find any after unspecified "chemical tests," and further dismissed the idea of salts in suspension in the atmosphere because the shells in consideration were not near the sea.

Byne decided that the cause of the efflorescence was butyric acid. He apparently determined this by the vinegary smell (which would indicate acetic acid), by chemical tests showing the presence of calcium butyrate, and by his assumption that the butyric acid was liberated by the breakdown of organic matter. In other words, parts of the animal left in the shell would rot and release butyric acid, which would then attack the shell. He further stated, "The fact that the shells exposed to daily public inspection in the top cases are less attacked is explained on the hypothesis that the light acts as a deterrent." (*Ibid*, p. 176).

Byne suggested that specimens adhered to cards with gum arabic were attacked more than specimens adhered with Canada balsam. He noted that the specimens adhered with Canada balsam were attached to glass instead of to card stock, but made no connection between the material and the deterioration.

Byne's "prevention" was definitely worse than the problem:

"In the case of those shells which are badly affected, nothing can be done, and their instant removal is absolutely essential, for if left they only increase the mischief with those just beginning to show signs of corrosion. I recommend that they be soaked for twenty-four hours in a solution of corrosive sublimate (1 part in 1000 water) and then thoroughly dried. As an experiment all shells should be subjected to such a treatment, in the hope that it may prove effectual." (*Ibid*, p. 177).

For those of you who, like me, tried to sleep through chemistry, corrosive sublimate is mercuric chloride. Between its use and the tasting of the shells, it is possible that there was a high turnover in Victorian conchologists.

Byne's first presentation was read before the Society in February 1899; his second in June of the same year. Here he amplified his original conclusions:

"At the time of writing my former paper I did not possess any knowledge of bacteriology, but I had come to the conclusion some months before that the corrosion was due originally to the action of bacteria." (Byne, 1899b).

Byne's reasoning ran thus:

1. Butyric acid compounds are present.
 2. Butyric acid does not exist in the atmosphere; it must have an external origin.
 3. It must come from fermentative breakdown of the animal.
 4. Both aerobic and anaerobic bacteria "can cause various carbohydrates to ferment, producing butyric and acetic acids" (*Ibid*).
 5. Often a portion of the liver is left attached to the interior apex of the shell.
 6. This and the adhesive could both undergo anaerobic fermentation in a hermetically sealed case.
 7. Butyric acid has been found.
 8. The shells in the top cases exposed to light are unaffected, and light is "deadly" to bacteria.
 9. Therefore, the process of deterioration is caused by bacteria.
- A breathtaking example of circular logic with no testing or proof, and no real understanding of microbiology at all, this contention has stayed in the literature on the subject for nearly 100 years.

Byne rejected suggestions from peers to treat the shells by boiling them in oil or rubbing them with turpentine (a reversal from his first paper), oil of cloves, or formalin, for which we should be moderately thankful. Without ever doing a culture from the shells or any other work to determine the culprit, Byne stated that he was more than ever convinced that the problem was bacterial and that the corrosive sublimate treatment was the only one.

After a seven-year break, Byne (1906) published in the *Journal of Conchology*, a brief note with a decidedly hostile tone that his opinions on corrosion of shells had not changed and that he was still of

the opinion "that the mischief is the result of the action of Bacilli." He wrote that "extensive chemical experiments" showed butyric acid on the calcium carbonate of the shell resulting from the bacillus of butyric fermentation. He added that he "never isolated any definite bacillus, as I have neither the knowledge or means of doing so..." and "I have not seriously considered the problem of damp, because it has not come into any case I have looked into...Nor does the suggestion of Mrs. Kenyon that 'saline particles' are responsible recommend itself to me." He went on to recommend the following prevention methods:

"The shells must first be thoroughly soaked in water, rubbed with soap, and then perfectly dried. They are then to be rubbed over with a small quantity of linseed oil, any excess being removed with a rag. I am quite sure that this treatment will act efficaciously. I formerly recommended soaking the shells in a solution of corrosive sublimate, but this is cumbersome. I find it a good plan to take the drawers out of my cabinet and leave them in the air for a day. This does away with chance of mustiness and damp. I have a great objection to the smell of oil of cloves, and should never use it. I shall be pleased to receive criticisms or suggestions." (Byne, 1906).

One has to wonder why, if dampness is dismissed as a source, the airing of the cabinet drawers to minimize exposure to damp is necessary. A few pages later in the same edition, the following note was published by B.R. Lucas:

"Sometime back, after reading Mr. Byne's paper in this *Journal*...I thought it advisable to sterilize my shells, and started, unfortunately, on some of my best, viz., *Cypraea pallida* (Gray); these shells of the dark type had a brilliant polish and free from any markings or spots other than the natural ones on the shells. I soaked them for two days in warm water at about 37°C, then put them in a solution of mercuric chloride, 1 gramme in 500 cc. of water. They remained in this for twenty-four hours at 37°C, were then taken out and allowed to dry without polishing. I made sure that the ...solution was not acid, yet when I started to polish up the shells with a clean duster I found that the lustre was considerably impaired, and that the shells were marked nearly all over with bright yellow metallic looking spots that seem to have got underneath the enamel of the shell, and through microscopic cracks in the enamel..." (Lucas, 1906).

Byne responded to Mr. Lucas in the next edition in which he stated that he had "withdrawn this treatment in favour of the rubbing over of the surface of a shell with linseed oil" (Byne, 1907). Although Byne's science is certainly suspect, the term "Byne's disease" had become entrenched.

In 1907, Agnes Kenyon read her second paper on the subject of corrosion of shells at the Society's September meeting but the text was not reprinted. In 1908, Byne resigned from the Society with no further publication on the subject.

In 1909, Mrs. Kenyon published "On the

Deterioration of Shells in Cabinets." She reopened the discussion of the effects of humidity or dampness, noting that severe fading and a whitish film had occurred in instances of shells being in damp storage areas (the latter in a room where plants were growing in an ornamental rockery full of water). She noted:

"I have also seen a general collection, which was kept shut up in a locked cabinet, with numbers of shells clouded over or streaked with a sort of efflorescence--I do not think there was any corrosion, but simply a blotching of the surface. This I attribute to the fact that the owner resided for several years close to the sea. When a high wind drives the breakers to shore, the air is laden with saline moisture which is carried a considerable distance inland....viz. corrosion of shells, whether due to bacteria or some other cause, I have had no experience, nor have I ever noticed the vinegary aromatic odour...."

"My collection has always been admired for the beautiful polish of the specimens--those, of course, which do not naturally possess an epidermis--and I am usually credited, by non-collectors, with the use of chemicals to achieve this effect. I immerse my shells in very hot water, sometimes with a little soap in it, for a longer or shorter period according to the solidity or delicacy of the specimens, and then, after draining the shell thoroughly, I dry with a soft rag and polish with another one. The use of oil is only permissible for faded or dead shells in order to bring out the colour and improve the worn parts. Soap, if used, should be dissolved in the water and not rubbed on the shell, and if the shell is very thin and delicate it is better to use tepid water. Shells with an epidermis should never be put into fresh water or the epidermis will crack and peel off. I should be inclined to suggest to the South Kensington Museum authorities to try very hot water as a cure for the corrosion from which their shells are said to suffer. I am unable to make the experiment, as I have never had an instance of such corrosion in my own cabinets" (Kenyon, 1909).

This is noteworthy because Mrs. Kenyon recorded two of the major factors in the development of "Byne's disease": high humidity and confinement in a cabinet. History does not record what her cabinets were made of, but the cabinets at the Natural History Museum were always made of oak, and oak was a popular wood for this purpose. She, and Byne in his original paper, were very close to the true cause but did not quite pinpoint it.

Lucas, (1916) in a note on land snails, described a "fungal treatment" of linseed oil, benzol, and thymol, inside and out, to treat what was probably not a fungus but rather an efflorescence.

In 1934, British government chemist John Ralph Nicholls cited Dr. Alexander Scott at the British Museum (Scott, 1921) as saying that lead medallions in oak museum cases became badly corroded even when not in contact with the wood.

It was certainly never generally recognized by shell collectors before this date, at least not in print. Nicholls (1934) pointed out that oak and some other hard woods

such as teak continually evolve traces of acetic acid even when seasoned. He studied shells affected with the white efflorescence at the Natural History Museum and deduced that there was no evidence to support a bacterial attack. Nicholls studied a range of shells in various stages of deterioration. He noted that the efflorescence could be scraped off, but not simply brushed off. He found that it was soluble in water and consisted almost wholly of calcium acetate and some traces of other salts. All the affected shells had been stored in oak cabinets, not treated in any way other than washing, not lacquered or varnished, and were exclusively marine. Vaseline-coated shells were not affected, and the museum atmosphere "is normally dry."

"The mechanism of the deterioration therefore appears to be as follows: The oak wood of the drawers continually emits traces of acetic acid and these vapours can only escape with difficulty from the closely-fitting drawers. Marine shells retain sea-water which, on evaporation, leaves a small residue of salts; according to the amount of sea-water and to the porosity of the shells, this residue may be spread over the shell or be located at the place to which the sea-water drains. This residue, being hygroscopic, is in a condition to absorb the acetic acid vapours, which would react with the calcium carbonate of the shell forming the incrustation. Where dirty shells had been washed the salt would be removed and the normal surface of the shell, not being itself hygroscopic, would not absorb the acetic acid and would not be attacked.

"The prevention of such deterioration would appear to be simple. Either oak cabinets should not be used or all shells before being mounted should be washed and dried. Added precautions when oak cabinets are used would be the periodical aeration of the drawers by opening them, and the smearing of the shells with Vaseline if this does not affect their appearance." (*Ibid*).

There, 62 years ago, in a brief and well-reasoned paper with thorough analytical testing to back up its results, was the real answer, or most of it. Minus, of course the Vaseline (I'll discuss surface treatments later). If anyone should be recognized today, it should be Nicholls and not Byne.

Calclacite, or calcium chloride acetate, was identified as a specific efflorescence "found on fossils and limestones in wooden museum cases" in 1958. This specific form includes a chloride ion and is most likely found where there is a source of chloride (Van Tassel, 1958). Calclacite is sometimes used as a synonym for Byne's-type efflorescence, but that is inaccurate, as will be seen shortly.

In 1961, S.G. Clarke and E.E. Longhurst studied the effects of acetic acid vapors from wood on metals and found that such corrosion was very dependent on the concentration, the metal, and the relative humidity (RH). Corrosion-time curves increased dramatically

with higher RH levels. When acetic acid vapors in a 1% solution were added to the atmosphere, the corrosion was even more widespread and damaging. Kiln-dried woods in confined atmospheres with zinc samples liberated acetic acid vapors that aggressively attacked the metal (Clarke & Longhurst, 1961). This closed-system testing method was later refined by W.A. Oddy (1973) of the British Museum and is standard practice today for testing materials that will be in close contact with each other.

Products made from wood--cardboard, paper, and the like--also tend to be acidic unless specifically treated to remove the acids. Acid-free or alkaline-buffered products are normally marketed as "archival."

Museum conservators have followed this problem with very useful results. E.W. FitzHugh and R.J. Gettens (1971) described calclacite and other salts found on objects in wooden cases. They found that calcareous materials reacted with acidic vapours to form calclacite (calcium chloride acetate) and that lead, zinc and vitreous enamel yielded formate salts. FitzHugh and Gettens suggested that hygroscopic salts already present in the materials would deliquesce at high RH to produce a liquid site for reactions.

This paper was reinforced in 1982 by a paper titled "Trouble in Store" by Tim Padfield and his colleagues. In researching the problems associated with poor storage design and materials, the authors noted the following:

"In this laboratory we have identified calcium acetate and calcium formate as a 1 mm-thick corrosion crust on a cowrie [sic] shell which was originally aragonite...It had been stored for five years in a box of Douglas fir with a glass lid. We have also found a hydrated calcium acetate nitrate growing on a carved coral brooch. The corrosion had penetrated so deeply that when the salts were washed out the coral was quite porous."

Padfield and his colleagues classified this and many related problems as being symptomatic of "internal pollution"--the result of acetic, formic, and other acid vapors liberated by the various woods, cloths and papers making up storage and display case environments. Synthetic materials also deteriorate and release volatile compounds. The better the case is sealed and the less often it is opened, the more such vapors can damage materials stored for long periods of time. In effect, sensitive and hygroscopic materials act as absorbers of internal pollutants, with distressing results. Padfield and his colleagues found that museum cases were typically 100 times less well ventilated than the room around them. In effect, the "hermetically sealed" cases Byne mentioned were doing more harm

than good. Though they were doubtless not truly hermetically sealed, the closed internal circulation and very low leak rate compounded the problem caused by the case materials. Padfield concluded with recommendations for increasing the amount of air exchange in cases.

In 1985, Norman Tennent and Thomas Baird published the definitive paper on the chemical identification of mollusk shell efflorescence. Noting that the problem remained serious and poorly understood in malacological collections, Tennent and Baird re-examined the work of Byne and Nicholls. They found that the only conclusion of Byne's that was sound was that not all shells are affected, and that Nicholls had oversimplified the problem by identifying the efflorescence solely as calcium acetate. Using infrared spectroscopy, Tennent and Baird determined that, in spite of Byne's claims, calcium butyrate and other butyric acid products were never found even in shells that were exposed to a butyric acid atmosphere for 18 months. Exposure to acetic and formic acid, however, resulted in efflorescence formation within hours.

Tennent and Baird found that gastropods and bivalves were both susceptible, as were land shells and marine shells. Efflorescence on marine shells is much more widespread, however. The periostracum was not quite as protective as Mrs. Kenyon thought: Tennent and Baird observed efflorescence popping through the periostracum. Nevertheless, the most vulnerable spots on a shell are those that are most worn and least protected. Protection was also afforded somewhat by surface coatings, including Byne's linseed oil. It was difficult to identify all factors when specific preparation techniques were seldom documented, but the practice of boiling shells in salt water may have contributed to later deterioration.

The efflorescences Tennent and Baird identified tended to be calcium acetate or a calcium acetate-formate double salt. The common feature of all the shells examined was their long-term storage in oak cabinets. They authors also determined that some shells showed, not an efflorescence, but a layer of aragonite converted from calcite. They leave open the question of whether this is a prelude to breakdown. Calcium stearate and salts of fatty acids have been observed in unique instances where the parent compounds were found in the storage media.

"The removal of efflorescence is not problematic; since the salts are water soluble, cleaning in water is an effective treatment. Nonetheless, because efflorescence occurs as a result of reaction

of calcium carbonate with acid vapours, the shell surface is often irreversibly disfigured. Thorough water-washing probably carries the advantage of aiding in the prevention of deterioration. There is considerable circumstantial evidence that collections treated by soaking or boiling in water are less susceptible to Byne's disease...

"Since oak and certain other woods are the principal source of deleterious acid vapours, storage cabinets should be made of safer materials. It is fallacious to assume that old oak cabinets will no longer liberate acetic acid; an oak core from a lead statue dating from the eighth century BC has been shown to liberate sufficient acid to corrode lead, even after almost three millennia. The possibility of coating wood in a bid to seal in harmful vapours...is a topic of current research. Despite the prevailing view that varnish provides little protection against acid vapours, long-term protection has been afforded by the coating applied to certain shells at the end of the last century." (Tennent & Baird, 1985).

Mollusk shells are clearly not alone in their vulnerability to acidic storage environments; the same problems have been noted in collections on birds' egg shells in museum collections (Agnew, 1981).

This should be the end of the story, but is not. The information has been slow in reaching the shell collectors' community. In 1980, Alan Solem published his standards for malacological collections, adopted by the Council of Systematic Malacologists and later reprinted in *Curator*. In this report, he states that light-free and dust-proof cases are sufficient to protect collections, without ever considering what materials to recommend in the construction of those cases. Many popular publications recommend a variety of storage methods and preparation techniques which are damaging in the long run. Most surface coatings fall into that category, especially coatings based on shellac, cellulose nitrate, polyvinyl alcohol and the like. They tend to shrink and yellow over the years, marring the surface of the shell (or even destroying it in cases of severe shrinkage). They also tend to act as dust and pollutant traps as they soften in high temperatures, further darkening and obscuring the surface. Shells which might be useful for biochemical work should never be prepared with caustic compounds, heated or microwaved, or coated with anything.

Unforgivably, Abbott and Dance (1982) referred to Byne's disease as a "bacterial blight" as late as 1982.

"In some countries where cool, humid conditions prevail, a bacterial blight (sometimes known as 'Byne's disease') may attack glossy shells. The surface becomes chalky white and has a faint odor of vinegar. Badly damaged shells should be thrown away. Lightly affected shells should be soaked for a day in strong alcohol, then dried. Keep your shells in as light and airy a place as possible." (Abbott & Dance, 1982).

The most minimal of research would have kept this misinformation out of the popular literature. (The alcohol does nothing, needless to say, except to

introduce a new contaminant.) Even worse is the following recommendation from the 1985 **Cowries of the World**.

"If you live in a humid climate, mould may sometimes appear on the shells. This can be prevented or arrested by a small light bulb in the bottom of a 'well' made through the drawers of the cabinets. Bore a three-inch hole in the back of each drawer to promote the circulation of the warmed air which dries out the cabinet and effectively checks mould growth...Mould can be discouraged further by dipping the shell in 1:500 bichloride of mercury to which detergent has been added so the solution will spread smoothly over the surface. This chemical is deadly poison, and the shell should be handled carefully until dry." (Burgess, 1985).

Unfortunately, it can be hard to convince people that the fact that something has appeared in print does not make it true, or right, or valid for all time. A little work would have shown that the problem is not mould, and that the use of a deadly antiseptic would do no good.

Shell Club newsletters provide a wealth of "tips," some good and some awful. The problem with most club newsletters is that the articles are unreviewed, so anything that the editor allows in gets printed. These should be read with healthy skepticism. Really good articles tend to hatch further articles in bigger journals; be wary of those that sound good but are never picked up by a reviewed journal. For example, an article in the **American Conchologist** (Davies, 1987) starts off strongly, but veers off into speculation that the true culprit is carbon dioxide in the atmosphere. There is no experimental evidence provided and no suggestions for further work: the author sets out his speculations as fact. The mechanism is based on the assumption that carbon dioxide will "leach" out of the air when humid air cools and condensation forms. Such a system would have to be ultra-closed and--internally--ultra humid, far more so than even most unprotected storage. It is an example of bad science--Byne science, if you will--in print.

What is the answer? Very simply: many shells cannot last long in acidic storage environments. It is not a complicated problem and does not require complicated solutions. The ideal solution is to store shells in steel cabinets with powder-paint finishes, in archival boxes and trays. Cotton, cork, and plastics should also be avoided. Labels and tags should be generated on acid-free paper. Older labels should be encapsulated in Mylar (never laminated!) and archived separately. Cases should have a low but steady air exchange at the rate of one change per day. Specialized cases for storage and display can be constructed to hold the

specimens within at a constant RH and temperature, with filters to absorb outside pollutants.

That is the ideal, and not an inexpensive one. A more practical approach would include the following preventive conservation steps:

1. Write down everything you do to a shell and keep a permanent record of all chemicals and methods used in its preparation. Problems may not show up in your lifetime, but may plague your heirs or beneficiaries, who will need to know how a shell has been treated in the past in order to save it.
2. Invest in archival storage supplies, even if it is only a few boxes at a time.
3. If you have the option, replace wooden cases with steel ones. If you don't have that option, definitely avoid the use of plywood and particle board at all times, which evolve acidic vapors from their glues as well as from the wood itself. New wood is more acidic than old wood, and hardwoods are more acidic than softwoods. Cork is very acidic.
4. Use freezing instead of pesticides or fumigants.
5. Plastics vary tremendously. Never use PVC plastics: they are a source of chloride radicals as they break down². Stable and inert plastic materials such as Mylar, Ethafoam, and the like are acceptable.
6. Spend the most money on the materials that will be in direct contact with the specimen, such as labels and trays. This is an important investment.
7. Look into wood coatings. Museums use a variety of paint-type coatings to minimize the release of organic acid vapors from wood. It's better in the long run to coat the wood rather than the shell.
8. Use anoxic barrier films to create enclosures for shells if storage in wooden cases is unavoidable.

Above all, remember never to rely on outdated literature. Be wary of claims in unreviewed journals, or those that are more than 15 years old. Find out if new research has come along that sheds more light on the subject. Don't look for a magic chemical in place of common-sense approaches. Don't accept untested

² A simple test to determine if a given plastic is a PVC plastic or not is known as the Beilstein test. Form the end of a clean copper wire into a small loop, and hold the loop in a bunsen burner flame to get rid of residual impurities. Touch the hot loop to a non-essential sample of the plastic, to melt a bit of the plastic onto the loop, and return the loop to the bunsen flame. A brilliant green flame indicates the presence of PVC. Plastics that "smell like plastic" are losing their plasticizers and deteriorating, and should be avoided.

hypotheses as recommendations.

Byne's "disease" is not a disease, and our understanding of it owes very little, ultimately, to Byne and his work. But, like the Holy Roman Empire or the Irish elk, it is a misnomer that has become so entrenched that there are no useful synonyms yet.

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BOOK NEWS

VITA MARINA INTERNATIONAL MAGAZINE ON SEA AND SHELLS

Subscription rate: US \$52. (surface); \$58. (air).
4 issues per year and newsletter *Spirula*.

This bilingual magazine on marine zoology, with excellent English translations, has been published since 1991 as a continuation of a previous Dutch periodical. The first volume of the new series is no. 41. Each issue, of about 25 to 30 pages, treats the Mollusca worldwide and is profusely illustrated with fine quality photographs both in color and black and white.

The current issue, volume 43(3-4), has two large articles: one of 16 pages with 3 plates by Mulder & Voskuil on the mollusks of the lagoons of the French Mediterranean coast and another 26-page paper with 4

color plates (some showing the animal as well as the shell) by Goud & Neefs on the marginellids of the southeastern North Atlantic Ocean collected during the CANCAP and MAURITANIA expeditions, in addition to three smaller illustrated papers.

Previous issues have had major papers by Finet (Galapagan mollusks), Kronenberg (Personidae with description of a new species) and Wagner (European Pectinidae).

The issues of the newsletter *Spirula*, also quarterly, each have articles (one on a trip to Baja California Sur, Mexico) in addition to book reviews, meeting notices, announcements, personal subscriber ads and paid advertising.

For a subscription, mail to: VITA MARINA, Postbus 64628, NL-2506 CA DEN HAG, the Netherlands.

A GREAT FIND OFF PT. LOMA, SAN DIEGO

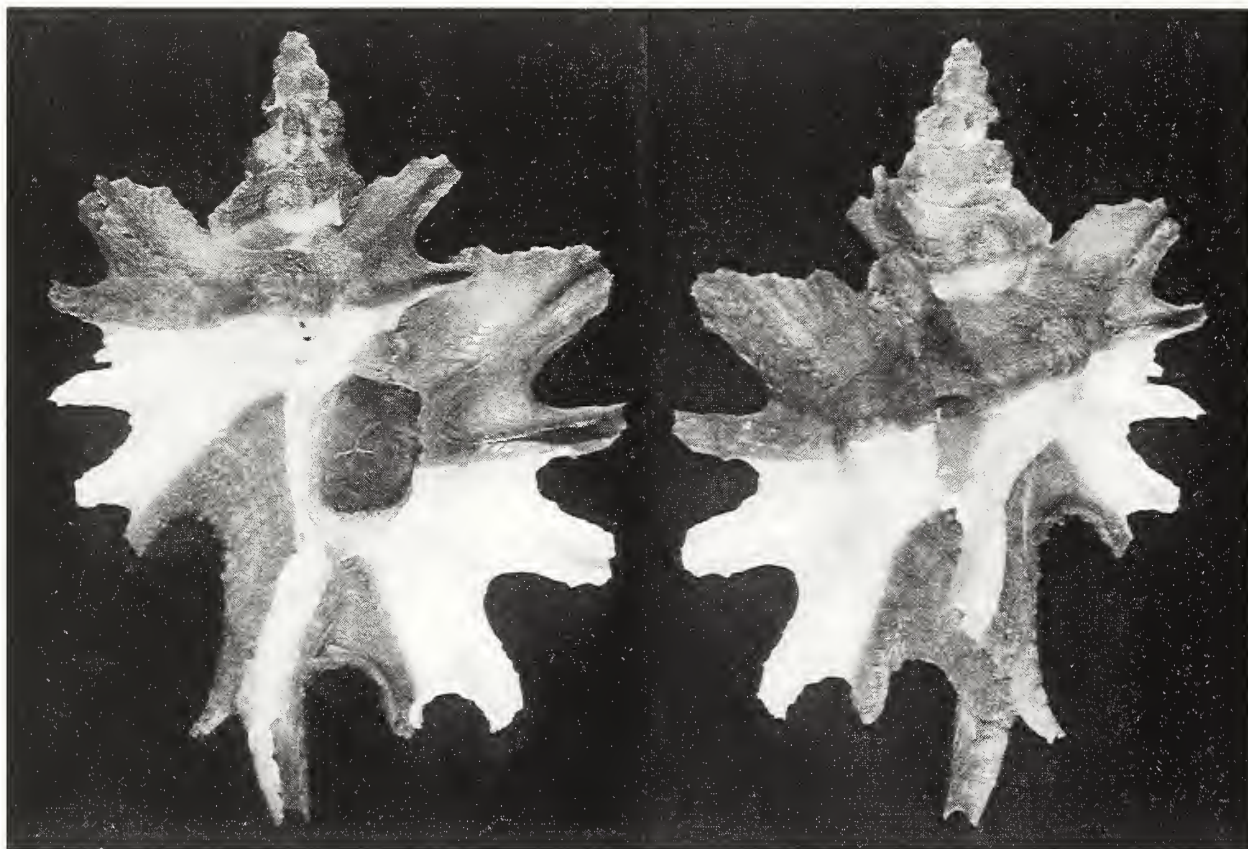
LARRY CATARIUS

4173 Galt St., San Diego, CA 92117, USA

On 1 July 1995, Bob Pike, Chuck Reitz and I were diving off Pt. Loma, San Diego. On the first dive we anchored in 70 to 75 feet (21-23 m) of water with the object of finding *Chlamys hastata* (Sowerby, 1842). We all found at least one specimen of the pecten plus the muricid *Pteropurpura macroptera* (Deshayes, 1839).

For our next dive we decided to move to the end of Pt. Loma and anchored in 75-80 feet (23-24 m).

On approaching the sea floor we dropped off the cliff to bottom at 100 feet (30 m). The substrate then gently sloped down and was flat and silty with round rocks of various sizes. In between two rocks, I saw a white object. On picking it up I found that it was a *Pteropurpura macroptera*, the banded form called *tremperi* (Figures 1 and 2). Also on this dive we found a number of *Chlamys hastata* and two dead specimens of *Cancellaria cooperi* Gabb, 1865.



Figures 1 and 2. *Pteropurpura macroptera*, white banded form known as *tremperi*, 62 mm L (1) apertural view (2) dorsal view. Photos: D. W. Mulliner.

ADDITIONAL RECORDS OF *POLINICES SIMIAE* (GASTROPODA: NATICIDAE) IN THE EASTERN PACIFIC

HENRY W. CHANEY

Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

As a result of Michael Hollmann's recent report (March, 1996) on the occurrence of the Indo-Pacific naticid *Polinices (Mammilla) simiae* (Deshayes, in Deshayes and Edwards, 1838) from Isla del Coco, I have recently examined the material collected during expeditions to western Panama in 1993 and Clipperton Island in 1994 (see Small, 1994a,b).

One specimen of *Polinices simiae* was found in each of these collections, thereby extending its known range east to the continental shelf of west America and north to another oceanic island of the eastern Pacific. During my survey an additional specimen was also discovered in the Shasky Collection from Isla del Coco (SBMNH 55245); this one measures 21 mm and was dredged dead from 100 m off Bahía Chatham in April 1986.

While both specimens from Panama and Clipperton are immature, the diagnostic features which distinguish *Polinices simiae*, as illustrated by Hollmann, can be discerned easily, particularly the color of the protoconch and the dark line which borders the suture of the body whorl.

The provenance data for these new records, figured below, are as follows:

Figure 1a-b. One dead specimen collected from the north side of Clipperton Island, 10°18.166N 109°11.542W in 15 m, 22 April 1994 by Kirstie Kaiser. 11 mm. In the Kaiser Collection.

Figure 2a-b. One dead specimen collected from a submerged reef, Isla Ladrões, Golfo de Chiriquí, Panama, 7°53.30N 82°28.30W, in 10 m, 13 April 1993 by Henry Chaney. 8 mm. SBMNH 55246.

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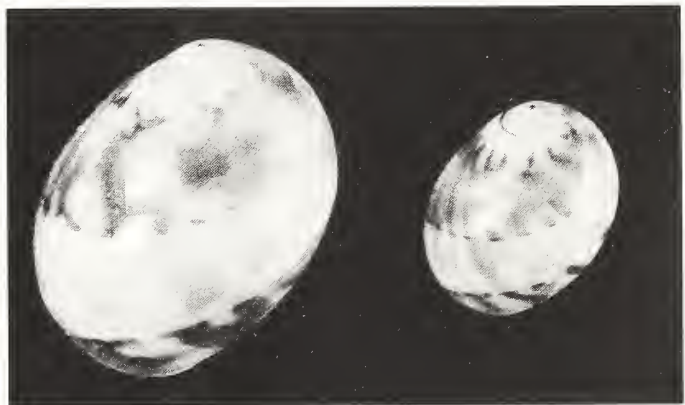


Figure 1a. Clipperton Island.

Figure 2a. Panama.

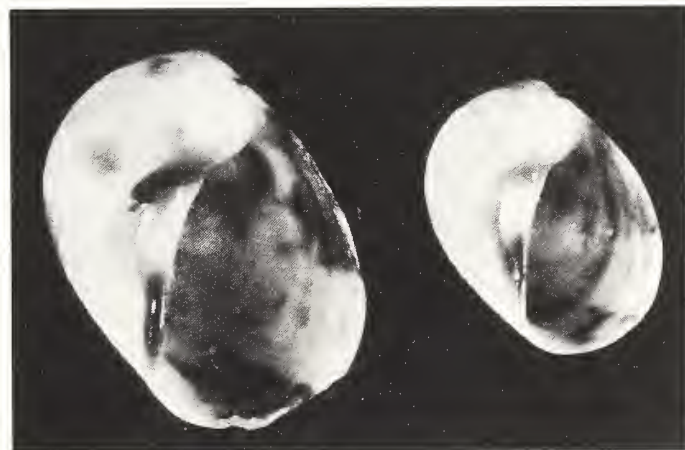


Figure 1b. Clipperton Island.

Figure 2b. Panama.

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THE FESTIVUS

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Meeting date: third Thursday, 7:30 PM
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PROGRAM

Chitons from Head to Tail

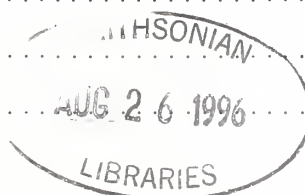
Douglas J. Eernisse of California State University, Fullerton, and a specialist on the chitons, will present an illustrated talk on the biology of chitons including their anatomy and DNA results.

Meeting date: 15 August 1996

Shells of the month: Chitons

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CLUB NEWS

From the Minutes of the Meeting of the San Diego Shell Club, 18 July 1996

President Bill Romer called the meeting to order at 7:45 p.m. The minutes of the June meeting were accepted as published in **The Festivus**.

An upcoming August Club event is the Bizarre Bazaar (see below). A sign-up sheet will be passed around at the next meeting for the September Party.

Carole Hertz introduced Gerard Reimer, the winner of this year's Science Fair who will present an overview of his winning project at the August meeting. Carole presented Gerard with his award, Morris, Abbott & Haderlie's (1980) **Intertidal Invertebrates of California** and Bill presented him with his winner's certificate.

Terry Arnold introduced Terry Gosliner, the evening's speaker, after John Jackson announced Terry's new book [with Behrens & Williams], **Coral Reef Animals of the Indo-Pacific**. He said there is a Club special for advance purchases of the book since many Club members were involved in it and Terry mentioned that San Diego is the birthplace of the book.

Terry's presentation was a fascinating look at the sea life of coral reefs. He described three reef areas: the fringe, the barrier, and the coral atolls. The reefs are rich in life. According to Terry, there are many undescribed species, many of which are commonly found. Some of the most interesting observations made were the associations among various animals. For example, a boxer crab will use small sea anemones on its claws for defense and some hermit crabs will move anemones to larger shells with them. The slides of the colorful mollusks, flatworms, etc. were quite impressive.

The winner of the door prize was Bill Romer. The meeting was adjourned and everyone enjoyed refreshments, the Club library and socializing with one another.

Silvana Vollero

You Can Now Reach the Club by FAX

The Club has joined the Twentieth Century with its purchase of a FAX machine. It will be of considerable

help to those who try to reach either the Club or **The Festivus**. Manuscripts for **The Festivus** can now be submitted by FAX as well as by mail.

The FAX machine is located at the publication's office and the FAX number is (619) 277-6259.

The Bizarre Bazaar at the Bradner's

The Bizarre Bazaar will be held on August 4th from 1:00 to 5:00 p.m. on the deck of the Bradner's home at the La Jolla Summit, 1867 Caminito Marzella, La Jolla. [Take Valverde off Nautilus. Wind up the hill and make a left onto Caminito Marzella.]

For those who plan to attend, make sure to bring a table or stand to display your shells. For others, just come and enjoy the displays. It's always a casual, fun get-together with friends buying, trading, admiring and just plain visiting. Try to make it!

The September Party

The September Party will be held on Saturday evening September 21st beginning at 6:00 p.m. at the home of Marty and Terry Arnold. The theme this year is "Come as Your Favorite Character," real or fictional. Attendees are asked to bring their favorite dishes (each to serve 12). A sign-up sheet will be passed around at the August meeting.

Plan to come in attire suitable to your "favorite character." It'll be great fun to see how many "characters" we have in the Club. For further information, contact either Marge Bradner (619-459-7681) or Carole Hertz (619-277-6259).

A map to the Arnold residence appears on the last page of this issue.

Summer Sale of Club T-shirts

The Club's brightly printed t-shirts will be on sale at the August meeting at the very low price of \$10.00 apiece. It's a good opportunity to get these shirts at a bargain price and enjoy them for the summer. The remaining Club mugs will also be available.

ADDITIONAL DISTRIBUTIONAL RECORDS OF INTERESTING
AND RARELY COLLECTED MARINE GASTROPODS (EPITONIIDAE)
FROM THE TROPICAL EASTERN PACIFIC

DONALD R. SHASKY

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This is a continuation of my report on distributional records which commenced in the April 1996 issue of *The Festivus*. This paper deals only with the Epitoniidae. I cite extensively Helen Dushane's 1974 paper on the Panamic-Galapagan Epitoniidae and again I use the numbers from Keen (1971), where possible, for easy reference.

Some of the records on the mollusks of Manabí Province, Ecuador (Shasky, 1984), were overlooked by Skoglund (1992) in her monumental paper updating the literature on the gastropods of the Panamic Province between 1971 and 1992. The nine species are listed here as follows: *Asperiscala acapulcana* Dall, 1917; *A. canna* (Dall, 1919); *A. eutaenia* (Dall, 1917); *Nitidiscala polita* (Sowerby, 1844); *Nitidiscala suprastrata* (Carpenter, 1857); *Amatea deroyae* DuShane, 1970; *Hirtoscala replicata* (Sowerby, 1844); *Opalia crenatoides* (Carpenter, 1864); *O. crystallina* (Carpenter, 1864); *O. spongiosa* Carpenter, 1864. I also correct an erroneous citation that I made for *Opalia paulula* DuShane, 1974, in my Manabí Province paper.

611 *Asperiscala acapulcana* Dall, 1917. I previously reported this species from five localities in Manabí Province, Ecuador. I have also collected six lots from six dive sites at Isla del Coco, Costa Rica, in depths of 9-38 m, with a total of 11 specimens (April 1983, March 1984, April 1987 and March 1985). I also collected one specimen from a dredge haul in 91-127 m off the NE point of Isla Manuelita, May 1986 and four specimens dredged off Bahía Chatham in 30-91 m, both at Isla del Coco.

616 *Asperiscala emydonesae* (Dall, 1917). Known from the Golfo de California south to the Islas Galápagos (DuShane, 1974), this is a new southern mainland record for this species. Ten intertidal,

crabbed specimens were collected on the west side of Punta Ancón, Guayas, Ecuador, 6 March 1970.

617 *Asperiscala eutaenia* (Dall, 1917). Dall simply gave a range for this species as "Gulf of California." Reported from Manabí Province, Ecuador, but without collecting data (Shasky, 1984), my specimens were dredged in 30-37 m in Bahía Drake, Isla La Plata.

631 *Asperiscala walkerianum* Hertlein & Strong, 1951. DuShane reported this species from the northern Golfo de California to Nicaragua. I have 14 specimens that were dredged at Punta Chame, Cocle, Panamá.

653 *Asperiscala obtusa* (Sowerby, 1844). Reported by DuShane (1974) to be distributed from the Golfo de California south to Colombia and to Punta Santa Elena, Guayas, Ecuador (type locality). I collected five crabbed specimens intertidally at El Rubio, Perú, 19 April 1972.

632 *Asperiscala zeteki* (Dall, 1917). Described and reported only from Panamá, I have collected this species at the following locations: one specimen in sand and three specimens under rocks in 1.5 m, El Pulmo Reef, Baja California Sur, México, 23-25 April 1965 and 3 February 1966; one specimen trawled in 53 m, Station D-2 (15°57'N, 95°32'W), San Juan Expedition, Golfo de Tehuantepec, México, 15 July 1963; three intertidal specimens, crabbed, Salinas, Guayas, Ecuador, 5 March 1970; one intertidal specimen under a rock, Playas, Guayas, Ecuador, 8 March 1970; and four intertidal crabbed specimens, El Rubio, Tumbes, Perú, 16 April 1972.

--- *Nitidiscala suprastrata* (Carpenter, 1857). Prior to my report on finding this species in Manabí Province, Ecuador, it had been reported no farther

south than Mazatlán, Sinaloa, México, the type locality. I have found five specimens intertidally at La Cruz de Huanacoxtle, Nayarit, México, October 1973 and October 1977. In Panamá I found one intertidal specimen at Palo Seco, Zona del Canal, April 1973, two specimens at Kobbe Beach, Zona del Canal, intertidally on anemones, June 1977, one intertidal specimen under a rock at Isla Boyarena, Archipelago de las Perlas, 27 February to 2 March 1979, and one intertidal specimen at El Rubio, Tumbes, Perú.

669 *Alora gouldii* (A. Adams, 1857). Known from Manzanillo, Colima, México to off Panamá taken intertidally and to a depth of 30 m (DuShane, 1974) and Guayas, Guayas, Ecuador (Skoglund, 1990). I collected one live specimen from 54 m, Station D-2 (15°57'N, 95°32'W) on the San Juan Expedition, Golfo de Tehuantepec, Chiapas, México, 15 July 1963. This is a new depth record.

631 *Amaea deroyae* DuShane, 1970. This species is known throughout the Golfo de California to the Islas Tres Marias, México and the Islas Galápagos, Ecuador. I reported this species from Manabí Province, Ecuador, and now report nine specimens from dredgings in 91-94 m about 6 km NE of Isla Manuelita, Isla del Coco, Costa Rica, March 1984 and May 1986.

678 *Opalia crenatoides* (Carpenter, 1864). Known from Cabo San Lucas, Baja California Sur, México throughout the Golfo de California to the Islas Galápagos (DuShane, 1974) and Panamá (DuShane, 1985). Besides the Manabí Province locality (Shasky, 1984), I have also taken one specimen intertidally on the west side of Punta Ancón, Guayas, Ecuador, 5 March 1970.

681 *Opalia infrequens* (C.B. Adams, 1852). Described from Panamá and reported from Santa Cruz Island, Channel Islands, California south along the southern California coast to Mazatlán, Sinaloa, México and Panamá (DuShane, 1974), I have three lots from Isla del Coco, Costa Rica, dredged in 66-126 m from

three dredge sites for a total of four specimens, March 1984 and May 1986.

684 *Opalia mexicana* Dall, 1908. Reported from México at Bahía San Carlos, Sonora, (Poorman & Poorman, 1988), Mazatlán, Sinaloa (Hertz & Hertz, 1983), the coasts of Jalisco to Guerrero (DuShane, 1974), to Panamá (DuShane, 1985). I collected three crabbed specimens intertidally at El Rubio, Tumbes, Perú, 6 April 1972.

685 *Opalia paulula* DuShane, 1974. This species was described from Bahía Cuastecomate, Jalisco, México. I erroneously reported it from Manabí Province, Ecuador (Shasky, 1984). However, I have collected three lots for a total of four specimens from three dive sites at Isla del Coco, Costa Rica (April 1983, March 1984, and March 1986).

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ANNUAL MEETING OF THE WSM

JULES HERTZ¹

Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

The 29th annual meeting of the Western Society of Malacologists (WSM) was held 23-26 June 1996 at the Handlery Hotel & Resort, San Diego, California. There were 65 people in attendance for the three days of papers and social events. It was a very interesting meeting in a very centralized location, ideal for getting to the Mexican border, San Diego's many fine restaurants, beaches and tourist attractions.

The 23rd was a relaxing, get-reacquainted day. Following afternoon registration, there was the Opening Reception, a Wine and Cheese Party, hosted by the San Diego Shell Club (Figure 1). This was well-attended by both conference attendees and San Diego Shell Club members and provided a good beginning for the meeting.



Figure 1. Nora Foster and Carole Hickman at the reception

The technical portion of the meeting started on the 24th, with contributed papers in the morning and a symposium in the afternoon entitled "Invertebrate DNA: Prospects and Problems." Of extreme interest to shell collectors was a paper by Sally Y. Shelton called "The Shell Game: The History of Byne's 'Disease'" (see the June 1996 issue of *The Festivus*). She reviewed the characteristic breakdown of malacological specimens in collections storage, the contributory causes, and sound recommendations for dealing with the problem. One of the fine afternoon papers of interest to the attendees was entitled "Evolutionary History and Origins of Feeding Specializations in the Marine Gastropod Genus *Conus*." Thomas F. Duda, the author, from the University of Hawaii, Kewalo Marine Laboratory, was awarded the Best Student Paper Award for this paper. This was a very significant achievement in that there were nine papers vying for the award. A slide show provided entertainment in the evening. Members showed slides of specimen shells, shelling trips, beautiful opisthobranchs, and collecting of freshwater mollusks in Alaska.

The 25th started with a Paleontology session. Of particular interest to San Diego Shell Club members were talks concerning the San Diego area. These included Thomas A Deméré's "Overview of Pleistocene Paleontology and Stratigraphy of Coastal San Diego County," Wes Farmer's "Field Observations of Eocene Bivalves and Gastropods at Torrey Pines State Beach and Sea Cliffs, San Diego and Del Mar, California," and George L. Kennedy's "The Late Pleistocene Invertebrate Record of San Diego Bay, Southern California." In the afternoon, the symposium on "Biology and Evolution of Cypraeoidea" was held. Two papers that I found very interesting were "Schilder

¹ Mailing address: 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA

Revisited" and "Molecular Phylogeny of Living Cypraea," both presented By Christopher P. Meyer. The social event of the evening was the sale of reprints followed by the annual auction of shells, books, and art objects (Figures 2 & 3). It was a rip-roaring success



Figure 2. At the WSM reprint sale. Left to right: Jim McLean, Carole Hertz, Doug Eernisse, Dan Geiger and Don Shasky.



Figure 3. The auction preview. Left to right: George Metz, Ron Velarde, Roland Anderson and Kent Trego.

led by auctioneer Henry Chaney. His humor and cajoling and the outstanding donations available for bidding led to a record-breaking total. The highlight of the evening was a heated contest for a single specimen shell, which was finally obtained by the winning bidder

for \$750.

The symposium on "Functional Morphology and Natural History of Molluscan Feeding" was held on the 26th. The highlights for me were Carole S. Hickman's "Evolution of Gastropod Feeding: Multiple Phylogenetic Pathways Through a Structural and Functional Design Space" and Sandra Millen and Edmund Graziani's paper "Evolutionary Implications of *de novo* Biosynthesis of Defence Compounds in Opisthobranchs." Following the symposium was the annual WSM business meeting and that evening the Banquet. This year's guest speaker was Betty Jean Piech, who gave a very humorous talk entitled "Helpful Hints for Shell Collectors." The food was excellent and the camaraderie outstanding.

During the entire meeting, there were displays of shells and photographs for the attendees to view and enjoy. Additionally some of the attendees brought in small groups of Recent and fossil specimens for viewing (Figure 4). The meeting was very successful,



Figure 4. Examining fossil cowries. Left to right: Terry Arnold, Lindsey Groves and Walter Schroeder.

and we are all looking forward to next June when a combined meeting of the WSM/AMU will be held in Santa Barbara.

DISCUS ROTUNDATUS (MÜLLER): ANOTHER LAND SNAIL SIGHTED IN SAN DIEGO

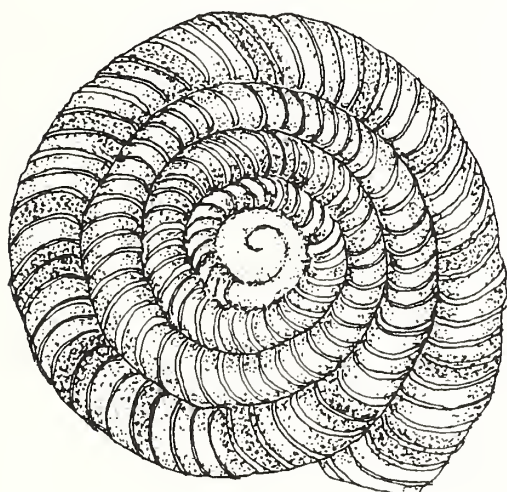
CAROLE M. HERTZ¹

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
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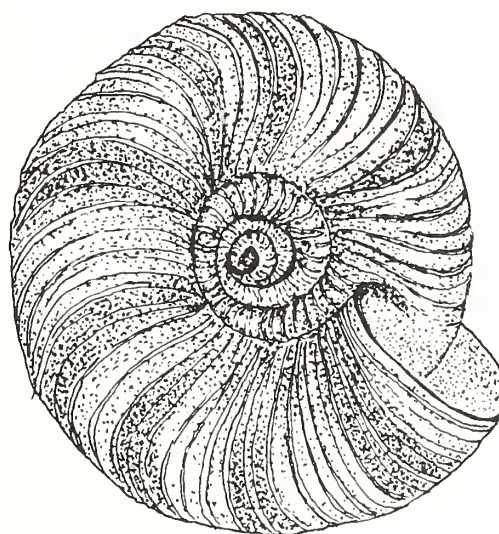
Once again, Richard Cerutti, of the Paleontology Department of the San Diego Natural History Museum, has brought an unusual terrestrial snail to my attention. Neither of us had seen this snail previously. A lot of 25 specimens from 3.6 to 5.0 mm maximum diameter was found by Marie Richard in San Diego in shrubs behind a condo complex on Gaines Street just east of Goshen Street (the north side of Mission Valley) and given to Richard by Marie's friend Jim Colclough on 28 February 1996. According to Jim Colclough, there were many more individuals there.

When I was unable to identify the species, I sent the specimens with a copy of the camera lucida drawings, shown here in Figures 1 and 2, to Dr. Barry

Roth in San Francisco. He kindly identified the specimens as *Discus rotundatus* (Müller, 1774) and sent me a copy of his 1982 paper in **Malacological Review** which reported on occurrences of this European and North African snail in greenhouses and lath houses in four counties of California: Santa Barbara, Ventura, Los Angeles and San Diego and noted its extensive distribution worldwide: from the southern part of Scandinavia to Algeria, from Spain and Ireland to the Ukraine and on the east coast of North America in Newfoundland, Massachusetts, New Jersey and New York. The San Diego County specimen, in the collection of the United States National Museum of Natural History (USNM), was "a somewhat worn shell



1



2

Figures 1 & 2. Camera lucida drawings of *Discus rotundatus* (Müller, 1774) (SBMNH 143255) from a lot of specimens found by Marie Richard. (1) spiral view of a 5.0 mm specimen (2) basal view of a 4.7 mm specimen.

¹ Mailing address: 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA.

collected at Oceanside, San Diego Co., on fern, July 14, 1950, by H.H. Keifer (California Department of Food and Agriculture)" (Roth, 1982).

Discus rotundatus, a beautiful species which appears to prefer moist areas under ground litter, has a flattened disk-like shell with a protoconch of 1½ smooth brown whorls, a teleoconch of 4½ whorls colored from cream to dark brown and strongly obliquely ribbed and a large, deep umbilicus. This appears to be the first account of the species within the city of San Diego. The specimens have been deposited in the Santa Barbara Museum of Natural History (SBMNH 143255).

ACKNOWLEDGMENTS

My thanks to Barry Roth for again identifying our terrestrial finds, to Joyce Gemmell for the camera lucida drawings of the species and to Richard Cerutti for continually finding new malacological mysteries.

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A USEFUL TOOL FOR COMPUTER SPELL CHECKERS

PAUL SKOGLUND

3846 E. Highland Avenue, Phoenix, Arizona 85018, USA

Spell checkers found in most word processors contain thousands of words but are very sparse in words aimed at a particular specialty. This tool was developed in response to the need of my wife, Carol, for a way to check certain molluscan words not normally found in most spell checkers.

First I compiled a list of scientific names of Panamic Province Mollusca. This list contains all those names used in Keen (1971) and Skoglund (1989, 1991a,b, 1992) plus others since those papers were published. To this list was added authors' names and many Panamic Province geographical place names. The list was checked for spelling accuracy and, where applicable, for proper diacritical marks.

We first used this molluscan list as a supplemental spelling list to our word-processor's main dictionary. It picked up spelling errors and typos but, as a supplemental list, did not display the correct spelling.

Our *WordPerfect 5.0* word processor package included a separate program that allowed additions and deletions to the main spell checker dictionary. I merged the molluscan word list into the main dictionary and now the spell checker not only finds the misspelled word but offers the correct spelling as a replacement option.

Once merged with the main dictionary, the list has several useful applications besides the primary one of

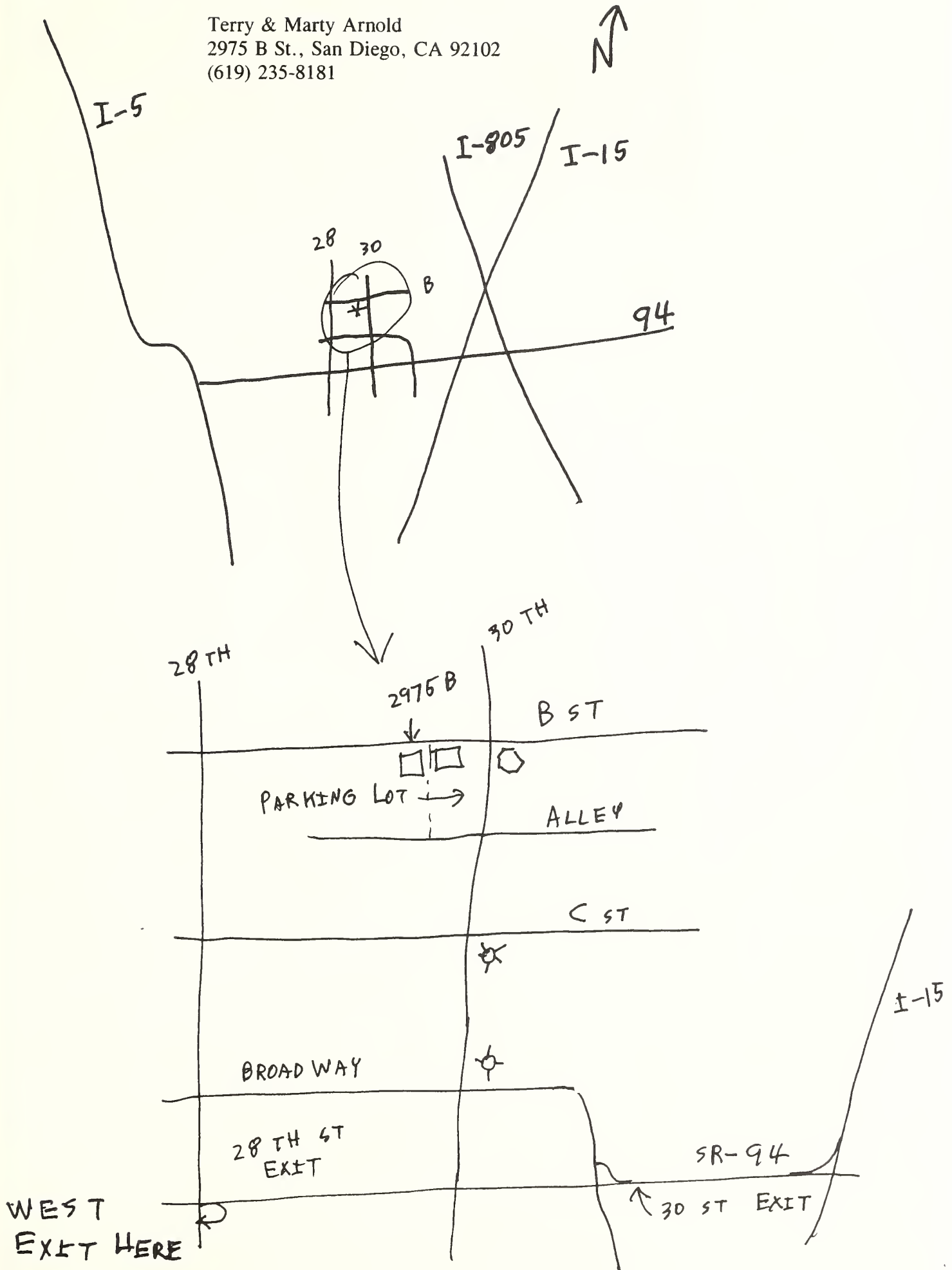
catching typographical errors. For instance, if you use the word "Galapagos" often in your text but don't want to stop to add the proper accent each time you type it, you can run your finished text through the spell checker. It will find each "Galapagos" and suggest "Galápagos" with the proper accent. This same application can be used for authors' names with diacritical marks of various kinds.

Thanks to Terry Arnold the list is being made available to interested parties on the World Wide Web. <http://www.users.cts.com/crash/t/tarnold/skoglund.html>

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THE FESTIVUS

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September 12, 1996

Number: 9

Special Issue

The Genus *Spondylus* (Bivalvia: Spondylidae) of the Panamic Province

Carol Skoglund and
David K. Mulliner





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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

THE SEPTEMBER PARTY

(See page 92, this issue.)

There will be no regular meeting this month.

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CLUB NEWS

**From the Minutes of the Meeting of the
San Diego Shell Club, 15 August 1996**

President Bill Romer called the meeting to order at 7:45 p.m. The minutes were approved as published in *The Festivus*. Bill reminded everyone that George Hanselman has plastic boxes for sale (price lists were available). Also, the 1997 Shell Desk Diary is now available. Two visitors were welcomed. One was Don Klaus, Kay's son, who recently relocated from Guam. Betty Westfall was the other visitor.

Bill passed around the sign-up sheet for food contributions for the September Party [see column 2]. The Bizarre Bazaar was very nice and we thank the Bradners for hosting this event. Marge Bradner announced that Billee Brown has a shell cabinet for sale. The cabinet is 66 inches high by 64 inches wide and has 46 drawers. The price will be best offer. Call Billee at (619) 454-5788 if interested.

Terry introduced two guest speakers for the evening. The first was Gerard Reimer, the Club Science Fair winner. Gerard gave an overview of his winning project, "*Stronglyocentrotus purpuratus*: chemotactic response to *Macrocystis pyrifera* extracts," explaining the four years of work that went into his final project. Everyone was impressed by his work, especially the filter system he built for the project. Gerard had received his prize at the July meeting.

Doug Eernisse was then introduced. Doug is an Assistant Professor at Cal. State Fullerton whose research has been on chitons. In his talk, "Chitons from Head to Tail" he discussed the anatomy of chitons noting that unlike other mollusks, chitons have living

shells. He also explained that their sensory organs can be a source of much information. A great part of Doug's work on chitons has involved testing the different ways of classifying them. He has also been working on a computer catalogue of over 840 species of chitons. The presentation explained many interesting details about chitons. After Doug's formal talk, those interested were shown, on Doug's laptop, how the chiton catalogue can be a valuable tool in the study of this group.

The winner of the drawing was Bob Petroski. We thank Marge Lindahl for providing the refreshments and Carole and Jules Hertz for their display of chitons. Everyone left the meeting looking forward to our next gathering - the September Party! See you then.

Silvana Vollero

The September Party

The September Party will be held on Saturday evening September 21st beginning at 6:00 p.m. at the home of Marty and Terry Arnold. The theme this year is "Come as Your Favorite Character," real or fictional. Attendees are asked to bring their favorite dishes (each to serve 12). A signup sheet will be passed around at the August meeting.

Plan to come in attire suitable to your "favorite character." It'll be great fun to see how many "characters" we have in the Club. For further information, contact either Marty Arnold (619-235-8181) or Carole Hertz (619-277-6259).

A map to the Arnold residence appeared on the last page of the August issue.

IN MEMORIAM**CLIFTON MARTIN**

We recently received word of the passing of Clifton Martin earlier this year at the age of 86 years. He was a member of the San Diego Shell Club for over twenty-two years. He was Club president in 1972 and also served as vice-president and secretary. He wrote over twenty articles for *The Festivus* between 1970 and 1979. The Club members have missed seeing Clifton in the last few years, and are saddened by his death.

THE GENUS *SPONDYLUS* (BIVALVIA: SPONDYLIDAE) OF THE PANAMIC PROVINCE

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Abstract: Of the thirteen names used for *Spondylus* Linnaeus, 1758, occurring on the mainland of the Panamic Province, only *Spondylus princeps* Broderip, 1833, *S. leucacanthus* Broderip, 1833, and *S. calcifer* Carpenter, 1857, are here considered to be valid species. A petition has been filed with the International Commission on Zoological Nomenclature to suppress the homonym *Spondylus princeps* Schreibers, 1793, in favor of *S. princeps* Broderip, 1833. *Spondylus ursipes* Berry, 1959, and *S. victoriae*, *auctt.*, non G. B. Sowerby II, 1859, are synonyms of *S. leucacanthus*. *Spondylus princeps unicolor*, *auctt.*, non G. B. Sowerby II, 1847, *S. crassisquama* Lamarck, *auctt.*, non Lamarck, 1819, and *S. pictorum* Chemnitz, *auctt.* non Schröter, 1786, ex Chemnitz MS, are synonyms of *S. princeps*. A lectotype is selected for *Spondylus calcifer*. *Spondylus limbatus*, *auctt.*, non G. B. Sowerby II, 1847, *S. radula* Reeve, 1856, non Lamarck, 1806, and *S. smithi* Fulton, 1915, are synonyms of *S. calcifer*. *S. dubius* Broderip, 1833, and *S. basilicus* Reeve, 1856, previously considered synonyms of *S. princeps* by some authors are figured, but not considered as part of the Panamic fauna. The shell figured by Olsson (1961) as *S. calcifer* is figured and identified as *S. cuneus* Reeve, 1856, which is not considered part of the Panamic Province fauna. Information on habitat and distribution is included. Three Indo-Pacific species reported from the Panamic oceanic islands are not included. They are *S. linguafelis* Sowerby, 1847, and *S. tenebrosus* Reeve, 1856, from L'île Clipperton and *S. nicobaricus* Schreibers, 1793, from Isla del Coco, Costa Rica.

INTRODUCTION

This study started as a result of seeing the *Spondylus* brought in by divers who work out of Loreto, Baja California Sur, México, and grew to include information from the other areas in the Panamic Province. The Loreto divers take huge piles of the longer spined *Spondylus* to sell for both meat and shells. These divers work off several islands in the Golfo de California near Loreto, including the Islas Coronados, Carmen, Danzante, and Monserrate, at depths of 18 to 30 m. Based on several hundred *Spondylus* examined, which were sorted into two kinds by the divers, two distinct species with different epifauna were differentiated.

Early taxonomic workers on *Spondylus* include Linnaeus (1758), Chemnitz (1784), Schreibers (1793),

Lamarck (1819), Chenu (1845), Küster (1858), Fulton (1915) and Lamy (1909, 1938). Hertlein and Strong (1946) summarized much of this work. More recent works include those of Zavarei (1973) and Lamprell (1987). Yonge (1973) described the functional morphology of the *Spondylus* hinge, ligament and soft parts. Waller (1978) redefined higher taxa relationships based on the ligament, mantle edge, periostracal groove and other anatomical features.

Abbreviations used:

AMNH	American Museum of Natural History, New York, New York
ANSP	Academy of Natural Sciences, Philadelphia, Pennsylvania
BJP*	Piech Collection, Hockessin, Delaware
BMNH	The Natural History Museum, London, England

¹ 3846 E. Highland Avenue, Phoenix, Arizona 85018, USA

² 5283 Vickie Drive, San Diego, California 92109, USA

BN*	Nicosia Collection, Phoenix, Arizona
C&JH*	Hertz Collection, San Diego, California
CS*	Skoglund Collection, Phoenix, Arizona
CASIZ	California Academy of Sciences, San Francisco, California
DM*	Mulliner Collection, San Diego, California
KK*	Kaiser Collection, Puerto Vallarta, Jalisco, México
LACM	Los Angeles Museum of Natural History, California
LB*	Buck Collection, Del Mar, California
R&FP	Poorman Collection, now housed at SBMNH
SBMNH	Santa Barbara Museum of Natural History, California
SDNHM	San Diego Museum of Natural History, California
USNM	United States National Museum (Smithsonian), Washington, D.C.
VU*	Upton Collection, Sierra Vista, Arizona
* indicates a private collection	

METHODS

The Panamic Province is the area between latitudes 31°N at the head of the Golfo de California and 25°N on the west coast of Baja California Sur, México, to 6°S along the Pacific coast of North and South America, and includes several oceanic islands. Indo-Pacific *Spondylus* species found on these islands are not within the scope of this paper. They are: *Spondylus linguaefelis* Sowerby, 1847, and *S. tenebrosus* Reeve, 1856, from L'île Clipperton and *S. nicobaricus* Schreibers, 1793, from Isla del Coco, Costa Rica.

Our primary study areas were off Isla Danzante, Golfo de California, and in Bahía de los Angeles, Baja California, México. Inspection by scuba diving, snorkeling and dredging were used to define the habitat of the *Spondylus*. Other divers provided additional habitat information from the Loreto area and other places within the Province. Visits to major museum collections provided information, but material from

many localities was lacking.

We found that *Spondylus* are extremely variable in shape, number and placement of spines and, to some extent, shell color. Exceptions can be found to most statements made about *Spondylus*; nevertheless, there are major differences between species in both shell morphology and habitat (Table I). We found hinge-tooth color, muscle-scar depth and callus, spine length and shape, shell color, and habitat to be the best characteristics for separating species. Features in common to all Panamic Province *Spondylus* species include a white porcellaneous interior cavity, occasional yellow umbones on the right (bottom) valve and serrate minor spines visible at 30X.

Once species were established based on the above criteria, measurements of 25 specimens from each group were made for ratios of shell height to length, hinge length to shell length, and length to width of the triangular ligament area. This proved only that we were working with variable species and provided no statistically significant information.

Measurements listed herein are length x height which includes the beaks but does not include the spines. Some published geological records were unfigured and these are noted as such.

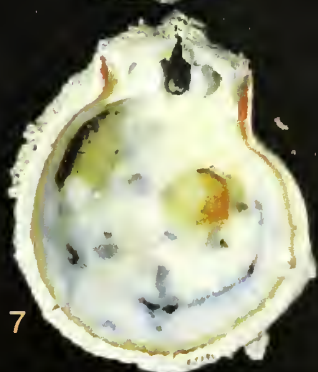
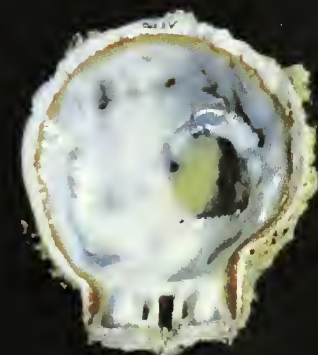
SYSTEMATIC TREATMENT

Family SPONDYLIDAE Gray, 1826

Medium-sized to large shells, strongly sculptured with spinose radial ribs; auricles small; without byssal notch; shells attached to substrate near the umbo of the right valve, which is convex (Keen, 1971). Cemented Pectinacea lacking simple, prismatic calcite; crossed-lamellar aragonite prominent, extending well outside pallial line nearly to distal margins and covering hinge plate, which bears prominent dysodont teeth. Byssal notch generally present in early growth stages and lacking a ctenolium. Mantle curtains without guard tentacles (Waller, 1978).

PLATE I.

Figures 1-10. *Spondylus leucacanthus* Broderip, 1833. (1-2) Holotype (BMNH 1950.8.28.5), La Plata, Ecuador, pair 51x54 mm; (3) immature specimens, off Isla Danzante, Golfo de California, left valves, top 22x54 mm, bottom 26x24 mm (CS); (4) Loreto divers, Golfo de California, left valve 92x85 mm (CS); (5) Guanacaste, Costa Rica, left valve 96x105 mm (CS); (6) same as (4), hinge detail; (7) Interior view, Bahía de los Angeles, Baja California, pair 120x141 mm (LACM 151615); (8) same as (4), muscle scar detail; (9) specimen figured by Sowerby, 1847, pl. 87, fig. 36 (BMNH); (10) after Reeve, 1856, species 6. Photographs 1, 2, 9 with permission of the British Museum (NH). Photograph 7 by D. K. Mulliner.



Genus *Spondylus* Linnaeus, 1758

Type species (subsequent designation: Schmidt, 1818): *Spondylus gaederopus* Linnaeus, 1758, Recent, Mediterranean.

Muscle scar large, posterior to the center of shell; cardinal area of hinge larger in the right valve, ligament deeply sunken in a triangular pit. Adult with two crural ridges adjacent to the ligament (Keen, 1971).

Spondylus leucacanthus Broderip, 1833

Figures 1-13

Spondylus leucacantha Broderip, 1833.

Broderip, 1833:5; Sowerby, 1847b:423, pl. 87, figs. 35, 36; Reeve, 1856: pl. 2, fig. 6; Norrid, 1994:57, fig. 1.

Spondylus pictorum Chemnitz, *auctt.*, non Schröter, 1786, ex Chemnitz MS.

Abbott, 1954:370, pl. 36, fig. a, top left, bottom right.

Spondylus princeps Broderip, *auctt.*, non Broderip, 1833.

Abbott, 1974:451, pl. 21, fig. 5223; Eisenberg, 1981:163, pl. 145, fig. 14; Lamprell, 1987:60, pl. 22, fig. 1; Moore, 1989:8, pl. 3, figs. 1, 10, pl. 4, figs. 3, 6.

Spondylus princeps leucacanthus Broderip, 1833.

Olsson, 1961:152, pl. 86, fig. 4, pl. 22, fig. 5.

Spondylus princeps form *leucacantha* Broderip, 1833. Lamprell, 1987:60, pl. 22, fig. 2.

Spondylus victoriae Sowerby, *auctt.*, non Sowerby, 1859.

Durham, 1950:68, pl. 15, fig. 3.

Spondylus ursipes Berry, 1959.

Berry, 1959:107; Keen, 1971:98, fig. 213; Hertz, 1984:18, fig. 34; Lamprell, 1987:56, pl. 20, figs. 2a,b; J. Smith, 1989:32, fig. 4.

Type material and locality: *S. leucacantha* - Holotype (BMNH 1950.8.28.50) pair, length 54 mm; height 51 mm. (Isla) La Plata, Ecuador.

S. ursipes - Holotype CASIZ 043984, pair, length 98 mm; height 126 mm. Off Isla Angel de la Guarda, Golfo de California, México. Paratypes: SBMNH 34011, pair, length 90 mm; height 125 mm; SBMNH 34012, pair, length 100 mm; height 120 mm. Puerto Refugio, Isla Angel de la Guarda, Golfo de California, México.

Description: *Spondylus leucacanthus* Broderip, 1833 (figs. 1, 2). The original description is translated from the Latin as follows: *Spondylus*, rotund shell, 6 ribbed, spiny, sort of golden or yellow colored, with sub-tongue, sub-reflexed longer white spines; interstitial striae; 3 (more or less) interstitial spined ribs, shorter spined; interior white, narrow margin pale yellowish; length 2 1/8, height 2 1/8, width 1 1/8 inches (spines not included).

Waller (pers. comm. May 1996) notes that the species name is based on the masculine Latin noun *canthus*, and therefore the correct name should be *leucacanthus* rather than *leucacantha*.

Additional description: Left valve with six primary rows of long, straight, narrow spines; spines on very young, small specimens (fig. 3) can be spatulate, rarely found on mature shells. Young shells with single row of small, sharp interstitial spines. Other rows of spines usually added after each resting stage. Interstitial spines on mature shell can vary from one to five rows; usually not seated on raised ribs as in *Spondylus princeps*. Color white through orange to coral red, rarely red-brown or peach. Right valve differing from left by foliaceous concentric ribs around small attachment area.

Discs of small, young specimens frequently orange. New growth most often white. Mature shell may have only the umbonal area orange (fig. 4), or major part of disc orange with white near margin. Occasionally shells all orange with all white spines or completely white. Completely orange or coral red (fig. 5) large shells relatively rare. Never dusty rose, or purple with orange spines. We have seen two shells with the major part of the disc yellow.

Hinge teeth (fig. 6) white, diagonal to hinge line, except in gerontic specimens in which teeth become heavier and more perpendicular to the hinge line (fig. 7). Adductor muscle scar (figs. 7, 8) deep with pronounced callus on ventral edge. Interior most often white. Interior shell margin color band usually near hinge when present, matches the exterior shell color. An occasional shell with a narrow color band around entire margin. Length to 156 mm.

Habitat: In the Isla Danzante area, *S. leucacanthus* is primarily a free-living species with occasional attachment of a small area to rocks or dead shells. Divers and dredgers report depths from 25 to 90 m, with a rare shell as shallow as 15 m. Colonies of 10,000 or more were seen on a sand bottom at 43 m. In previous years, large numbers were also seen on a sand bottom in the channel between the island and Baja

California Sur at 32 m. The fact that only the deeper living shells remain today may be a function of the depth that can be reached by the Mexican hookah divers in their search for food.

The epifauna on *S. leucacanthus* is distinctive. Many of the smaller shells are almost clean when brought up in the dredge or by divers. If there is growth on the shells, it tends to be bryozoans and sponges, rather than the coralline algae usually found on *S. princeps*.

Discussion: *Spondylus leucacanthus* Broderip, 1833, was described from Isla La Plata, Ecuador, without being figured. Both Sowerby (1847b) (fig. 9) and Reeve (1856) (fig. 10) figured the shell. Olsson (1961) figured the holotype and made it a subspecies of *S. princeps* Broderip, 1833, which was described from the same type locality. Olsson repeated that its distribution was confined to the coast of Ecuador. Keen (1971) made *S. leucacanthus* one of three synonyms of *Spondylus princeps* Broderip, 1833. Shasky (1980) reported taking *S. princeps* from Isla La Plata at a depth of 33 to 40 m. Of the five shells collected by him now at the SBMNH, four are actually *S. leucacanthus*.

Spondylus victoriae Sowerby, 1859, was originally described from the Golfo de California. Durham (1950) used the name without having seen Sowerby's original figure. However, it is an Australian species (E.A. Smith, 1884; Lamprell, 1987). The figure of Durham's hypotype (15418) appears to be *Spondylus leucacanthus*.

Bernard (1983) reported *S. victoriae* to be widespread in the Golfo de California and well represented in the Allan Hancock Foundation material at the LACM. None of the LACM material had any notations by Bernard to confirm which shells he considered to be *S. victoriae*, and all appeared to be either *S. leucacanthus*, *S. princeps* or *S. calcifer*.

Spondylus ursipes was described by Berry in 1959 (fig. 11). The holotype (CASIZ 043984) does not have the interior encircling orange-brown band noted in the original description of the species, but does have traces of color near the hinge line. The hinge teeth, not

mentioned in the original description, are white, massive and perpendicular to the hinge line (figs. 12, 13). The adductor muscle scar is deep and has the pronounced callus characteristic of *S. leucacanthus*. The elongate appearance of the holotype (Keen, 1971, fig. 213; Hertz, 1984, fig. 34) and two paratypes (SBMNH 34011, 34012) is due to the growth of the ligamental area, and not the shape of the disc (fig. 12). One paratype has the interior color band noted by Berry. The other has traces of interior color near the hinge. Shells taken from the more northern part of the range at Bahía de los Angeles and off Isla Angel de la Guarda in the Golfo de California, including the holotype and paratypes, are heavier than usual, with dirty white color and broken spines covered with heavy incrustation. Of the many hundreds of shells seen, only the heavy, ponderous ones have the teeth large and perpendicular to the hinge line. No small or lighter-weight shells of the same size were seen with this kind of tooth arrangement. All of the lighter-weight shells of the same size have much more delicate teeth set diagonally to the hinge line. Our assumption is that the heavy shells are gerontic *S. leucacanthus*, which by continually depositing material over the inner surface of the shell, have also required the migration of the massive teeth to a more upright position.

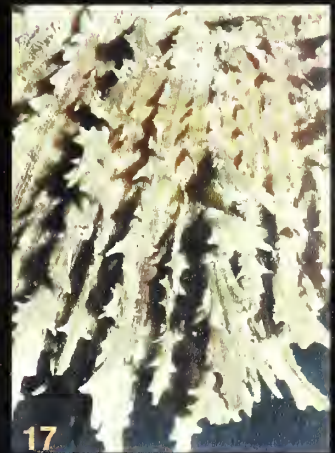
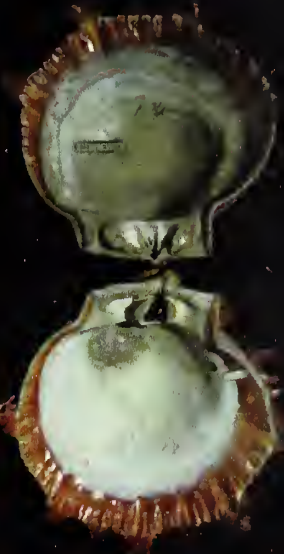
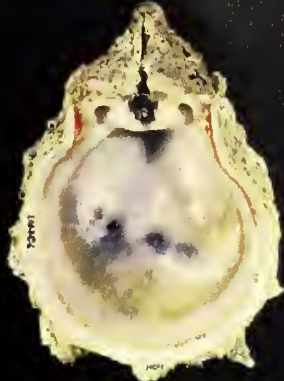
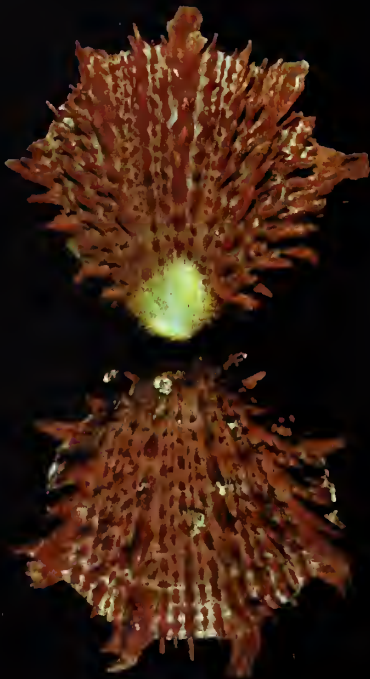
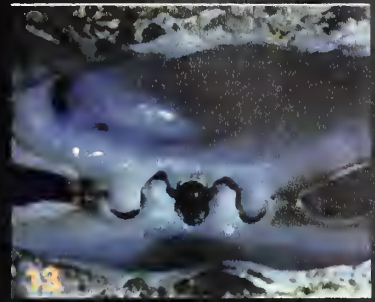
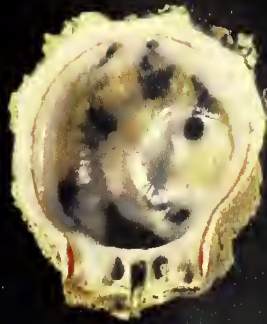
J. Smith (1989) figured *S. ursipes* (SBMNH 27380) from Bahía Adair, Sonora, México, which would be the northern-most record in the Golfo de California. Since the single valve was found intertidally at Cholla Cove (Bahía la Cholla), which is often used by shrimp boats to clean their decks and because the surrounding water is relatively shallow, we hesitate to include the record in the distribution of the species. The same can be said for a single specimen taken intertidally at Puertecitos, Baja California (SBMNH 21975). DuShane & Poorman (1967) reported a specimen of *S. ursipes* from the Berry collection as occurring off Bahía San Carlos, México. A search of the Berry collection, now housed at the SBMNH, failed to locate the shell.

Lamprell (1987; figs. 2a, b) thought *S. ursipes* was similar in texture to *S. calcifer* Carpenter, 1857, and might be a form of that species. He had not seen the

Plate II

Figures 11-13. *Spondylus leucacanthus* Broderip, 1833. (11) *S. ursipes* Berry, 1959, Paratype (SBMNH 34011), right valve 91x124 mm; (12) pair, interior view of (11); (13) same as (11) hinge detail. Figures 14-20. *Spondylus princeps* Broderip, 1833. (14-15) Holotype (BMNH 1952.5.10.7), Isla La Plata, Ecuador, pair 133x133 mm; (16-17) palmate spines, Isla San Pedro Martir, Golfo de California, left valve 79x80 mm (KK); (18) after Reeve, 1856, pl. 2, fig. 9; (19) specimen figured by Reeve, 1856, La Plata, Ecuador, left valve 73x83 mm (BMNH 1996060); (20) after Sowerby, 1847, pl. 88 fig. 45 (as *S. pictorum* Chemnitz). Photographs 14, 15, 19 with permission of the British Museum (NH). Photographs 11, 12, 13 by D. K. Mulliner.

→



type material, and his figures appear to be typical *S. leucacanthus*.

Spondylus pictorum Schreibers was the name used by Abbott (1954) for four figured specimens. Distribution was given as the Golfo de California to Panamá. Two of the four are easily recognizable as *S. leucacanthus*.

Material studied: México: Isla Cedros (AMNH) and Punta de San Pablo (CS, ex Jackson Collection) on the Pacific side of Baja California; Bahía de los Angeles, Baja California (LACM 151615; SBMNH 38367; CS; DM), Isla Angel de la Guarda (LACM 36-68 [1 of 2 in lot]; CASIZ 043984 [*S. ursipes* holotype]; SBMNH 23740, [*S. ursipes* paratypes 34011, 34012]); Loreto divers (CS); Isla Danzante (CS, DM); Isla Espíritu Santo (LACM 37-44, 40-85); La Paz, Baja California Sur (ANSP 298014) on the Gulf side of Baja California; Isla Tiburón (AMNH 7513160, 77006); off Guaymas, Sonora (AMNH 167699; SBMNH 22495); Mazatlán, Sinaloa (ANSP 120078), on or near the mainland. Costa Rica: Guanacaste (CS; VU). Panamá: Canal de Adentro, Golfo de Chiriquí (BJP). Ecuador: Isla La Plata (ANSP 298014, 55981; SBMNH 142626, 142627, 142628; BMNH holotype).

Distribution: Isla Cedros, on the Pacific side of Baja California and from Bahía de los Angeles, Baja California, México, to Isla La Plata, Ecuador. Depth: 15 to 90 m.

Geologic range: (as "*S. victoriae*") lower Pliocene, Pleistocene (Durham, 1950); (as "*S. princeps*") Pleistocene, Isla Coronado, Golfo de California; (as "*S. ursipes*") late Miocene or early Pliocene, west side of Sierra San Felipe, Baja California (J. Smith, 1989); Miocene, Isla Tiburón, Golfo de California, México (J. Smith, 1995, pers. comm.).

Spondylus princeps Broderip, 1833

Figures 14-27

Spondylus princeps Broderip, 1833.

Broderip, 1833:4; Reeve, 1856: pl. 2, fig. 9; Chenu, 1862:7, pl. 30, fig. 4; Olsson, 1961:152, pl. 86, figs. 1-1a, pl. 22, fig. 8; Keen, 1971:96, pl. 2, fig. 211; Eisenberg, 1981:163, pl. 11; Moore, 1987:8, pl. 3, fig. 9, pl. 5, fig. 6; Alamo V. & Valdivieso M, 1987:121, fig. 260; J. Smith, 1991:638, fig. 9d.

Spondylus princeps unicolor Sowerby, auctt., non Sowerby, 1847a.

Olsson, 1961:152, pl. 22, fig. 6; Keen, 1971:98, fig. 212; Lamprell, 1987:60, pl. 22, fig. 3.

Spondylus pictorum Chemnitz, auctt., non Schröter, 1786, ex Chemnitz MS.

Sowerby, 1847b:422, (pars) pl. 85, fig. 17, pl. 88, fig. 45; Abbott, 1954:370, pl. 36, fig. a, top right, bottom left.

Spondylus crasssquama Lamarck, auctt., non Lamarck, 1819.

M. Smith, 1944:51; Durham, 1950:68, pl. 15, fig. 1.

Type material and locality: *Spondylus princeps* - Holotype (BMNH 1952.5.10.7) pair, length, 133 mm; height 133 mm. Isla La Plata, Colombia [sic] Ecuador.

Description: *Spondylus princeps* (figs. 14, 15) described by Broderip is translated from the Latin as follows: *Spondylus*, rotund shell, 6 ribbed, red, spiny, with tongue-like wide spines; with 5 spiny interstitial ribs, bearing shorter spines; interior white, side border deeply plicate, red; length 5 1/8, height 5, width 3 inches (spines emphatically not included in these measurements). Found attached to coral rocks at the depth of seventeen fathoms. In old specimens the interior is of a brownish hue, especially at the hinge. - W.J.B.

Additional description: Left valve with raised radial ribs; six primary rows of medium length, spatulate spines. One to six rows of short, pointed, or occasionally palmate interstitial spines. A single shell in the Kaiser collection from Isla San Pedro Nolasco is distinct from all others seen in that the end of each spine is palmate (figs. 16, 17). Right valve differs in attachment area being supported by foliaceous concentric ribs.

Exterior color varying from shades of orange and light to dark red and purple. Two major varieties: dusty rose (figs. 18-21) and purple with orange spines (figs. 22, 23). Some color variation in each of major types, with color fading fastest in those with purple discs. Exterior shell and spine color never white, with exception of a small population at Islas Coronados, just north of Loreto, Baja California Sur, which has white spine tips (fig. 24). Hinge teeth in left valve are brown (fig. 25). Adductor muscle scars not sunken as in *S. leucacanthus*, callus hardly apparent. Interior margin with broad color band matching exterior color. An anomalous specimen (fig. 26) with white teeth was figured by Olsson (1961) and later by Keen (1971). Length to 145 mm.

Habitat: At Isla Danzante, *Spondylus princeps* lives with the right valve attached to rocks and occasionally to other shells. Depth: 3 to 28 m. At the lowest

depths it can be found in a transition zone with *S. leucacanthus*. No *Spondylus princeps* were found below 31 m except for a single shell taken at Isla la Plata, Ecuador at 32 m (SBMNH 142628) (Shasky, 1980). *Spondylus princeps* are frequently encrusted with coralline algae (fig. 27).

Discussion: Schreibers (1793) was the first to use the name *Spondylus princeps*. Cox (1928) concluded that the Schreibers' name should not be considered available. Lamprell (1987) found that the Schreibers' name, if valid, would apply to a form of *S. squamosus* Schreibers, 1793, from the Philippines. Application has been made to the International Commission on Zoological Nomenclature to suppress the Schreibers' name and to conserve *S. princeps* Broderip, 1833.

Spondylus unicolor Sowerby, 1847a, was described without locality and compared to *S. pictorum*, which it most resembles. It is figured here (fig. 44) for comparison, but is not considered to be part of the Panamic fauna.

Spondylus pictorum Chemnitz, auctt., non Schröter, 1786, ex Chemnitz MS was figured by Sowerby (1847b). Of the three shells figured, two (pl. 85, fig. 17; pl. 88, fig. 45) are typical *Spondylus princeps*. Sowerby gave the distribution as Isla La Plata, West Colombia [sic] Ecuador and the Gulf of Tehuan [sic] Tehuantepec. *S. pictorum* was considered to be the earliest name for the Recent west American form by some early authors, but the type locality is the Mediterranean and Aegean Seas (Hertlein & Strong, 1946). Lamprell (1987) gives the distribution of *S. pictorum* as the Mediterranean and Red Sea area.

Spondylus crassisquama Lamarck, 1819, from the "mers de l'Inde" and as a fossil from Carthagène was figured by Chenu (1862). Favre (1918), stated that Lamarck's Recent species should be referred to *S. pictorum* Chemnitz, but that the name *crassisquama* should apparently be restricted to the fossil forms from Colombia (Hertlein & Strong, 1946). Fulton (1915) considered *S. princeps*, *S. leucacanthus*, *S. dubius*, *S. pictorum*, and *S. basilicus* to be synonyms of *S. crassisquamatus* [sic] and gave the habitat as Island of

Plata, West Colombia [sic] Isla La Plata, Ecuador. Lamprell (1987) considers *S. crassisquama* a synonym of *S. pictorum* with a distribution of the Mediterranean and Red Sea areas. The shells figured by both M. Smith (1944) and Durham (1950) as *S. crassisquama* are *S. princeps*.

Material studied: México: Isla Cedros (SBMNH 38821), Isla San Benitos (LB) and Bahía Magdalena (USNM 264500) on the Pacific side of Baja California; Bahía de los Angeles (SBMNH 25269; CS; DM), Isla Angel de la Guarda (AMNH 77112; LACM 36-68 [1 of 2 in lot]); Isla Ildefonso, Golfo de California (BN); Islas Coronados (off Loreto) (CS; KK; VU), Isla Danzante (DM; CS; C&JH) and La Paz (ANSP 55992; 55986), on the Golfo side of Baja California; Isla San Pedro Martír (CS; KK), off Bahía San Carlos, Sonora (F&RP), Mazatlán, Sinaloa (ANSP 228006), and Isla María Magdalena, Islas Tres Mariás off Nayarit (AMNH 74613), on or near the mainland of México. Panamá: Isla Coiba (USNM 513595) and Canal de Adentro (BJP), Golfo de Chiriquí. Ecuador: Isla La Plata (ANSP 55994; SBMNH 142628; BMNH holotype).

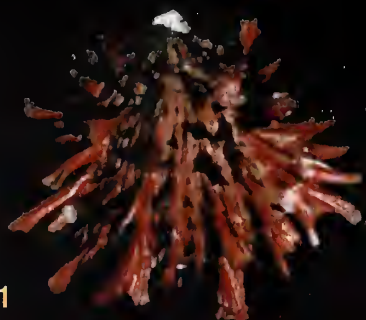
Distribution: From Isla Cedros, on the Pacific side of Baja California, and Bahía de los Angeles, Baja California and Isla Angel de la Guarda on the Baja California side of the Golfo de California, and Isla San Pedro Nolasco on the mainland side of the Golfo de California, and south to Isla La Plata, Ecuador. Shell illustrated by Alamo V. & Valdivieso M (1987) but not seen by us extends the distribution south to Chiclayo, Perú (6° 43' S).

Geologic range: (as "*S. crassisquama*") Pliocene, Islas Coronados, Isla Carmen, Isla San José, all Golfo de California (Hanna & Hertlein, 1927, unfigured); (as "*S. crassisquama*") Pleistocene, Isla Carmen, Golfo de California (Durham, 1950); Pliocene, Isla Cerralvo, Golfo de California (Hertlein, 1957, unfigured; Emerson, 1960, unfigured); Pleistocene, Isla María Cleofas, Islas Tres Mariás (Hertlein & Emerson, 1959, unfigured); Pleistocene, Isla Carmen, Golfo de California; Pliocene, Baja California (Moore, 1987);

PLATE III

Figures 21-27. *Spondylus princeps* Broderip, 1833. (21) La Paz, Baja California Sur, left valve 89 mm (ANSP 55992); (22) after Sowerby, 1847, pl. 88 fig. 17 (as *S. pictorum* Chemnitz); (23) Loreto divers, Golfo de California, left valve 97x90 mm (CS); (24) Islas Coronados, Golfo de California, left valve 102x92 mm (CS); (25) same as (23), hinge detail; (26) La Plata, Ecuador, left valve 90x85 mm (ANSP 55994); (27) encrustation detail, Isla Danzante, Golfo de California, left valve 146x145 mm (DM). Figures 28-32. *Spondylus calcifer*, Carpenter, 1857. (28) Lectotype (USNM 715914), Mazatlán, Sinaloa, Mexico, exterior view, pair 154x209 mm; (29) same as (28), interior view; (30) young specimen, Isla Danzante, Golfo de California, left valve 100x100 mm (CS); (31) same as (30), interior view; (32) same as (31), hinge detail, Puerto Lobos, Sonora, Mexico, pair 98x102 mm (CS). Photographs 27, 31 by D. K. Mulliner.

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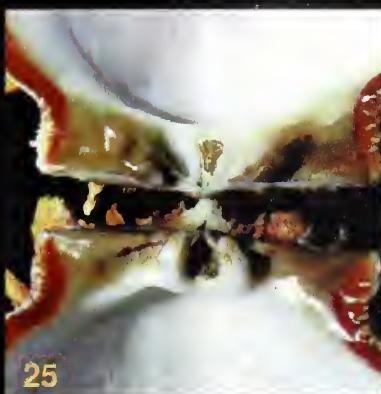
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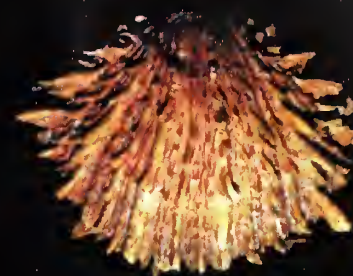
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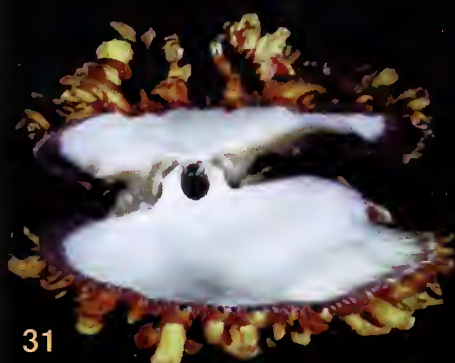
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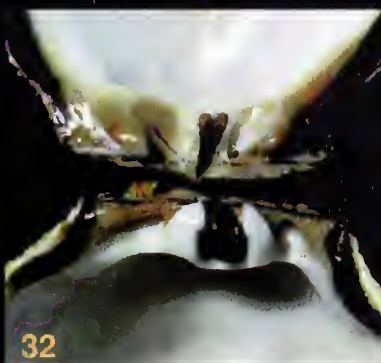
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early Pliocene, north of Loreto, Baja California Sur (J. Smith, 1991).

Spondylus calcifer Carpenter, 1857

Figures 28-37

Spondylus calcifer Carpenter, 1857.

Carpenter, 1857:152; Keen, 1971:98, fig. 210; Lamprell 1987:56, pl. 20, fig. 1; Moore, 1987:8, pl. 4, figs. 1,2,4,5.

Spondylus limbatus Sowerby, *auctt.*, *non* Sowerby, 1847a.

Reeve, 1856: pl. 9, fig. 34.

Spondylus radula Lamarck, *auctt.*, *non* Lamarck, 1806.

Reeve, 1856: pl. 14, fig. 52.

Spondylus smithi Fulton, 1915.

Fulton, 1915:357, new name *pro* *S. radula*

Reeve, 1856, *non* Lamarck, 1806.

Type material and locality: *S. calcifer* - Lectotype herein (USNM 715914) pair, length 154 mm, height 209 mm. Mazatlán, Sinaloa, México.

Description: *Spondylus calcifer* (figs. 28, 29) described by Carpenter is translated from the Latin as follows: ST. greatest, ponderous, solid, and for the most part circular; reddish-purple; upper valve covered with the least pointed and numerous ribs, hither and thither with irregular scaled ribs; with short scales, basally arched, above foliated; lower valve completely leafy; large area of ligament, but ligament emphatically not covered; subnacreous inside, side limb completely purple, or sometimes yellow-red; outer edges numerous and minutely crenulated; with stout teeth; well of ligament with 2-6 parallel channels, intersecting; muscle impression suborbicular, large.

Additional description: Left valve with radial ribs reduced to coarse threads on some specimens. Young specimens with numerous rows of short, spatulate spines in major and minor rows on some specimens but most often indistinguishable. Very young specimens growing in protected places with short sharp spines. As shell grows, spines tend to wear off; spines on new growth short, broad (fig. 30). Right valve usually completely attached, valve taking shape of rocks on which it lives, and like other species apt to have rows of foliation. When unattached, a portion of this valve can also have sharp spines, more elongate spines, or more rarely, rows of foliation.

Little trace of spines remain on adult specimens, which can weigh several pounds. Color red-purple or yellow-orange and red-purple with broad interior band

around shell margin of adult specimens matching the exterior colors, band less pronounced in young specimens (fig. 31). A population from Kobbe Beach, Canal Zone, Panamá, is completely orange. Shell exterior never white. Hinge teeth large and heavy (fig. 32), those in left valve brown, in right valve white and slightly grooved in young specimens. Adductor muscle scar in right valve variable from flat to deep with callus on ventral side. Shell margin crenulations more pronounced than in *S. leucacanthus* or *S. princeps*, and extend further into shell. *S. calcifer* has the most variable shape and greatest size of any Panamic Province *Spondylus*. Length to 249 mm.

Discussion: Only fragments of *S. calcifer* syntypes remain in the BMNH (Keen, 1968) because Carpenter (1857) broke the specimens up to extract boring, nestling and cemented mollusks. The last remaining complete syntype of *S. calcifer*, specimen number 208 from tablet 692-699 of the Carpenter Catalog (USNM 715914) (pers. comm. Alan Kabat), consisting of two large valves is **here chosen as lectotype** (figs. 28-29).

Spondylus limbatus Sowerby, 1847a, was described from the Persian Gulf. Without type material, which we were unable to locate, it is impossible to say if this very similar appearing species is the same as *S. calcifer*. The shell figured later by Reeve as *S. limbatus* (figs. 33, 34) (syntype, BMNH 1996059) is *S. calcifer*. Habitat is given by Reeve as Mazatlán and Panamá.

Spondylus radula Reeve, 1856, *non* Lamarck, 1806, (BMNH 1950.8.28.9) is also *S. calcifer* (figs. 35-37).

Habitat: At Puerto Lobos in the upper Golfo de California, México, *S. calcifer* can be found attached by almost the entire right valve to exposed boulders or under ledges at low tide level and below (Skoglund, 1974). In 1963, *S. calcifer* were so abundant in the intertidal zone near Santispac, Bahía Concepción, Baja California Sur, that they grew attached both to rocks and to each other (Skoglund observation). Divers report seeing them to 18 m.

Distribution: The head of the Golfo de California to Perú.

Material studied: México: Puertecitos (AMNH 257362), Bahía Concepción (CS); Puerto Escondido (DM), on the Baja side of the Gulf; Bahía la Cholla (CS) and Puerto Lobos (CS) on the mainland side of the Gulf. Panamá: Kobbe Beach, Canal Zone (CS *ex* Marti collection). Perú: Caleta Mero (ANSP 188318; CASIZ 036661).

Geologic range: Pleistocene, Bahía Magdalena, Baja

California Sur, México (Jordan, 1936); Pleistocene, Isla María Cleofas, Islas Tres Marias (Hertlein & Emerson, 1959, unfigured); Pleistocene, Isla Cerralvo, Golfo de California (Emerson, 1960, unfigured); Southern California to Baja California Sur, Miocene or Pliocene through Recent (Moore, 1987).

OTHER REPORTED SPECIES

Spondylus dubius Broderip, 1833
Figures 38-39

Spondylus dubius Broderip, 1833:4; unfigured.

Type material and locality: *S. dubius* - Holotype (BMNH 1950.8.28.1), pair, length 111 mm; height 105 mm. Gulf of Tehuantepec, America Centrali (Broderip, 1833). No locality on label.

This name was listed as a synonym of *S. princeps* by some authors, including Olsson (1961) and Keen (1971), and of *S. pictorum* by others. The white hinge teeth and short spines of the previously unfigured holotype make it distinct from all others seen by us. The holotype label has no locality information. Because it was reported from the Golfo de Tehuantepec [México] by Broderip, it is figured, but not placed as part of the Panamic Province fauna at this time.

Material studied: BMNH holotype.

Spondylus basilicus Reeve, 1856.
Figures 40-41

Spondylus basilicus Reeve, 1856: pl. 11, fig. 41.

Type material and locality: *S. basilicus* - Holotype (BMNH 1996058), pair, length 89 mm; height 78 mm. No locality given.

The taxon has been listed as a synonym of *S. crassisquama* by some authors and as a synonym of *S. princeps* by Lamprell (1987). Exterior similar to *S. princeps*, but teeth are white, while those of *S. princeps* are brown. Holotype label without habitat information. Figured here for reference, but until conspecific material from the Panamic Province is found it not considered to be part of that fauna.

Material studied: BMNH holotype.

Spondylus cuneus Reeve, 1856
Figures 42-43

Spondylus cuneus Reeve, 1856: pl. 15, fig. 56.

Lamprell, 1986:30, pl. 1, fig. 1.

Spondylus calcifer Carpenter, Olsson, 1961, *non* Carpenter, 1857.

Olsson, 1961:153, pl. 22, figs. 2, 2a.

Three shells at ANSP, said to be from La Plata, Ecuador, are this species, which is currently known from the Philippines, northwestern Australia, the Solomon Islands and the West Indies (Lamprell, 1986). One of the three (ANSP 55994) was figured by Olsson (1961) as *Spondylus calcifer*. Since there are no other examples in museums or private collections visited, the Ecuador locality is considered erroneous. The Olsson shell (fig. 19) is included here as a matter of reference.

Material studied: ANSP 55994, 55981 (2 shells in lot).

CONCLUSIONS

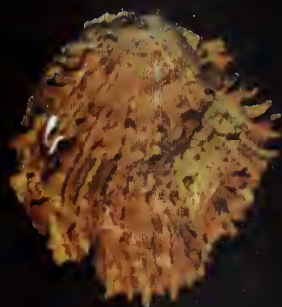
Spondylus leucacanthus is a valid species differing from *S. princeps* in having white hinge teeth, a deep adductor muscle scar with pronounced callus, a lack of raised radial ribs and long, narrow, frequently white spines, a deeper water habitat and epifauna of bryozoans rather than coralline algae. *Spondylus*

Plate IV

Figures 33-37. *Spondylus calcifer* Carpenter, 1857. (33) *Spondylus limbatus* Reeve, 1856, *non* Sowerby, 1847, after Reeve, 1856, pl. 9 fig. 34; (34) specimen figured as *Spondylus limbatus* Sowerby, 1847, by Reeve, 1856, pl. 9, spec. 34, left valve 108x95 mm (syntype, BMNH 1996059); (35) *Spondylus radula* Reeve, 1856, after Reeve, 1856, species 52; (36) *S. radula* Reeve, 1856, holotype (BMNH 1950.8.28.9), Tehuantepec, [Mexico] left valve 105x73 mm; (37) same as (36), interior view, pair. Figures 38-39. *Spondylus dubius* Broderip, 1833. (38) *Spondylus dubius* Broderip, 1833, holotype (BMNH 1950.8.28.1), left valve 111x105 mm; (39) same as (38), interior view, hinge. Figures 40-41. *Spondylus basilicus* Reeve, 1856. (40) after Reeve, 1856, species 41; (41) holotype (BMNH 1996058), specimen figured by Reeve, left valve 78x89 mm. Figures 42-43. *Spondylus cuneus* Reeve, 1856. (42) specimen figured by Olsson, 1961, as *S. calcifer*, La Plata, Ecuador, left valve 62x65 mm (ANSP 55994); (43) interior view hinge, La Plata, Ecuador, pair 73x92 mm (ANSP 55981). Figure 44. *Spondylus unicolor* Sowerby, 1847. Specimen figured by Reeve, 1856, pl. 10 fig. 37, left valve 86x86 (BMNH 1952.6.6.36). Photographs 34, 36-39, 41, 44 with permission of the British Museum (NH).



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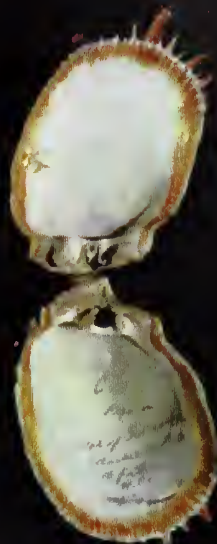
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TABLE I. Characteristics most often seen in adult Panamic Province *Spondylus*

<i>Spondylus</i>	<i>leucacanthus</i>	<i>princeps</i>	<i>calcifer</i>
Exterior features			
Color	white to orange, coral red	dusty rose, purple with orange spines	purple/orange, orange/yellow, all orange, all purple
Spines	long, straight, narrow	medium length, spatulate	short, spatulate to absent on adults
Radial ribs	hardly apparent	pronounced	coarse threads
Attachment area right valve	free living, occasionally attached by small area to dead shell or rock	attached to rock by small area	most of bottom valve attached to rock
Interior features			
Hinge teeth left valve	delicate, narrow, white, heavy in gerontic specimens	delicate, wide, brown	large, brown
Hinge teeth right valve	delicate, wide, white	delicate, narrow, white	large, white
Adductor muscle scar right valve	deep, with callus	flat	flat to deep with callus
Color band	narrow, usually present near hinge, occasionally around entire margin	broad, around entire margin	broad, around entire margin
Margin crenulations	more pronounced, less regular than in <i>S. princeps</i>	finer, more evenly spaced than in <i>S. leucacanthus</i>	strongest, extending further into shell
Habitat	sand, 18 to 90 m	rock, 3 to 28 m	rock, intertidal to 18 m

ursipes, a synonym of *S. leucacanthus*, differs only by having gerontic features, such as heavier shell, larger, more upright teeth, and longer ligamental area in some specimens.

Spondylus princeps differs from *S. leucacanthus* in having brown hinge teeth in the left valve, a flat adductor muscle scar without callus on its ventral side, a wide interior color band, shorter more spatulate

spines (not normally white), and exterior colors more often dusty rose to purple than those of *S. leucacanthus* which tend to be from white to orange. *Spondylus princeps* occurs at a shallower depth and the epifauna tends to be coralline algae. Because the name had been used earlier by Schreibers, and because none of the names previously used as synonyms are available, a petition has been filed with the ICZN to retain

the Broderip name. *Spondylus princeps* Schreibers, 1793, a name long out of use, is a form of *S. squamosus* Schreibers, 1793, from the Philippines (Lamprell, 1987).

Spondylus calcifer, by far the largest Panamic species, is an intertidal to subtidal species having brown hinge teeth, a flat adductor muscle scar, and a wide interior color band. The exterior color is most commonly purple, orange-yellow, or combinations of the two. It is usually attached by a major portion of the right valve. Young specimens may have short spatulate spines. These are usually missing on adult specimens that can weigh several pounds. A lectotype is designated herein.

Acknowledgments: Conversations with Eugene V. Coan, Paul H. Scott and Judith Terry Smith provided much information and encouragement. We are grateful to Paul H. Scott (SBMNH), Dr. James H. McLean and Lindsey T. Groves (LACM), Dr. Terrence M. Gosliner (CASIZ), Dr. Alan R. Kabat and Raye Germon (USNM), Dr. William K. Emerson (AMNH), Dr. Gary Rosenberg (ANSP) and Kathie Way (BMNH) for use of material in their respective institutions. Ann C. Payne, librarian, (SDNHM) provided some references. Dr. Hans Bertsch provided translation of the Latin descriptions. Suzanne Parlett designed the color plates and the cover. Rosemary Adams, Kirstie Kaiser, Larry Buck, Ann Marti, Betty Jean Piech, Forrest Poorman and Virginia Upton allowed use of *Spondylus* in their collections. A special thanks to the divers who provided additional habitat information: Rick Barilotti, George Barton, Barton Biller, Larry Buck, Carole Hertz, John Hornbek, Kim Hutsell, John Jackson, Kirstie Kaiser, Ken and Marge Lindahl, Bobbie Nicosia, Donald Shasky and Charles Waters. One color plate was made possible by the donations of Bob and Wendy Koch, David and Margaret Mulliner, Hal and Charlotte Norrid, Paul and Carol Skoglund, and Gladys Weber. Eugene V. Coan, Paul H. Scott and Thomas R. Waller critically reviewed the manuscript. Their suggestions are greatly appreciated. The encouragement and help of Carole & Jules Hertz is especially appreciated. Photographs are by Paul Skoglund except where noted. Without his photography and constant encouragement this paper would not have been possible.

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THE FESTIVUS

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

PROGRAM

Mechanisms for Protecting San Diego Bay and its Marine Habitat

Craig Sherman, a San Diego attorney with a law practice emphasizing environmental and land use issues

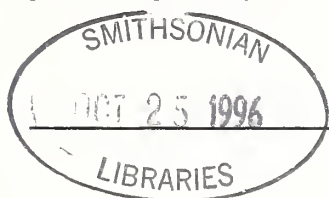
will be the speaker for the evening. This is an issue vital to all of us.

Meeting date: 17 October 1996

Shells of the month: Southern California bivalves

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CLUB NEWS

Membership Announcement

As usual, subscriptions for membership received after October 1 are automatically considered to be for the upcoming year -- in this case 1997. To receive a complete volume for 1996 after October 1, the cost will be \$20 for domestic subscribers. For overseas members, add \$5 to the current subscription rate.

Membership for 1997 is the same as for 1996 (see masthead). Included with the November issue will be the "pink slip" for 1997 dues. Those interested should add their FAX and E-mail numbers on the "pink slip" if they want them included on the roster for 1997.

The September Party

It was a lovely party - some members even came in costume! The Arnold's deck was filled with attendees enjoying the evening air and each other's company as well as the opportunity to view Terry's collection.

After a period of wine sipping and partaking of the contents of a beautiful antipasto tray prepared by Marty Arnold, guests dug in to the assorted dinner goodies.

If you didn't make it to the party, you missed a very good time. Our thanks to Marty and Terry Arnold for again hosting this event.

The Christmas Party

The Annual Christmas dinner party will be held on Saturday evening, December 14th in the Montfield Room of the Four Points Sheraton Inn. Mark your calendar and plan to attend. Details concerning menu, price and time will be announced at the October meeting.

Received for the Club Library

The 1996-97 edition of Tom Rice's **A Sheller's Directory of Clubs, Books, Periodicals and Dealers** was sent to the Club library. This 114 page comb-bound publication was sent to those clubs that completed the information form for this 20th edition.

A form will be available at the October meeting for

those members who wish to order personal copies. Also available will be the entry forms for those who wish to be included in the 1997 edition of Tom Rice's **Directory of Conchologists**. Listings are free.

A Motion Sickness Remedy

A "Readers' tips" note in a recent issue of **The San Diego Union-Tribune** included a letter from Yvonne Wiltens of Chula Vista whose husband studied herbs. She wrote that ginger is a remedy for motion sickness. She said that regular ground ginger or crystallized ginger in the dried fruit section of the market works, as well as putting the dried ginger in gelatin capsules. She says the capsules work best and suggests taking two capsules before leaving on a boat, car, plane etc.

Fall Sale at the October Meeting

With cooler weather arriving, it isn't too soon to stock up on sweatshirts. They'll be available at the October meeting for \$15.00, essentially at cost. Also on sale will be the t-shirts, still at \$10.00, and the remaining Club mugs.

The 2nd National Shell Show at Whangarei, New Zealand

The Whangarei Shell Club announces that it will be hosting the 2nd National Shell Show in Whangarei on 19-22 June 1997. The show will be run in conjunction with the Whangarei Rock and Gemstone Club in a large conference venue in central Whangarei. It will be a judged show catering to most classes of mollusks, including fossils. Judges will comprise several internationally known collectors and malacologists. There will be SCUBA diving and sightseeing trips, possibly visits to collections and space available for dealers to sell their material at the show. Inquiries received after 30 November 1996 cannot be guaranteed inclusion in the show.

For further information contact: The Shell Show Secretary, Mrs. E.A. Crosby, 29 Bush Road, Kamo, Whangarei, New Zealand. Phone/FAX (09) 4352555.

ON THE IDENTIFICATION OF *CORALLIOPHILA NUX* (REEVE, 1846)

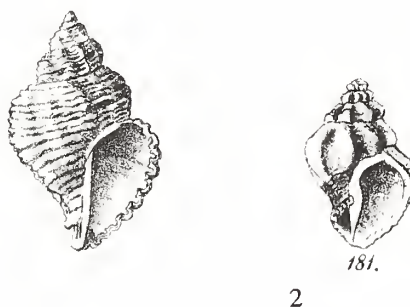
GEORGE E. METZ

121 Wild Horse Valley Dr., Novato, CA 94947, USA

The colonial zoanthid anemone identified and pictured by Kerstitch (1989) as *Palythoa ignota* is a common inhabitant of the intertidal area of the Golfo de California. Keen (1971) reported the association of the architectonicid species *Heliacus bicanaliculatus* (Valenciennes, 1832) with this zoanthid which presumably uses the zoanthid as prey. A coralliophilid has also been observed associated with this same species of zoanthid and also appears to be feeding on the zoanthid. The preliminary identification of the involved mollusk was *Coralliophila nux* (Reeve, 1846). Other observers felt that the species was *Coralliophila parva* (E.A. Smith, 1877).

This prompted me to make a more thorough investigation concerning the correct identity of the involved species. In Keen (1971), figure 1064 pictures two syntypes of *C. nux* (Reeve, 1846) from the British Museum of Natural History (on left) and a specimen from Stanford University (on right), and in figure 1066, two syntypes from the British Museum of *C. parva* (E. A. Smith, 1877) (on left) and a specimen from Stanford University (on right). Shells of both species appear similar, are close in size, and the major difference appears to be the more heavily corded spiral ribs on *C. parva*. Further illustrations of type specimens were presented by Kosuge and Suzuki (1985). The types of *C. nux* were illustrated in pl. 42, figs. 12, 13 (BMNH no. 1985040) and the type of *C. parva* was illustrated in pl. 47, fig. 8 (BMNH no. 1876.6.28.9). The reader is referred to this reference for illustrations. The photograph of *C. parva* in Kosuge and Suzuki appears to be the same specimen portrayed in Keen (1971, upper figure) and in the original description by Smith (Figure 1).

The descriptions in Kosuge and Suzuki describe *C. nux* as having "closely set, scabrous, spiral cords" and *C. parva* as having "broad, scabrous spiral ribs which alternate in size." *C. parva*, in their



Figures 1, 2. (1) *Coralliophila parva* (E.A. Smith, 1877), after Smith, 1877, pl. 11, fig. 6 (2) *Coralliophila nux* (Reeve, 1846), after Reeve, 1846, fig. 181.

photographs, appears to be a more elongate shell. Reeve (1846) pictured and described *Murex nux* in *Conchologia Iconica*, Vol. III, species 181 (Figure 2) with the following diagnostic features. "The Nut Murex. Shell abbreviately ovate, rather thick, transversely obsolete striated, umbilicated at the base, spire short, acuminate; seven-varicose, varices thick, solid, slightly nodose at the upper part, canal rather short, white within and without." E. A. Smith (1877:70) reported *Rhizochilus (Coralliophila) parvus* as "a short fusiformly-ovate shape, entirely white; the whorls are spirally lirated; two of the lirations on the upper whorls being stouter than the others; and those on the last are regularly alternately large and small, the stout ones being twice as thick as the latter. The aperture is bluish white, pyriform, and prolonged into the basal channel, which is somewhat recurved; the columella is straightish, thinly callous, smooth and shining; the labrum is strongly crenulated on the margin and armed within with about ten lirations, which do not extend far within the aperture."

A review of *C. nux* and *C. parva* in the collections of the California Academy of Sciences, revealed that the two species have been intermingled under each

name by a few collectors and that both species have about the same distribution, including the Galápagos. Superficially both species appear very similar with few characteristics that distinguish them. After examination of the lots at the California Academy of Sciences and comparisons made with the published descriptions and photographs of the references, the following diagnostic differences can be made. First, the spiral ribs of *C. nux* tend to be variable, ranging from almost smooth to scabrous and may range in height from flat to raised in various combinations, while the spiral ribs of *C. parva* are scabrous and consistently alternate in size. The junction of the outer lip with the body whorl in *C. parva* is almost 90° making a higher spired shell. This difference in junction also appears to be a distinguishing feature between the two species and raises the question as to the identity of the two syntypes illustrated by Keen (1971). The upper left shell (figure 1064) does not resemble the others in the photograph and fits the criterion for *C. parva*. The original illustration of *C. nux* by Reeve more closely resembles the lower left specimen of Keen's figure 1064. This same distinction can be seen in the Kosuge and Suzuki figures of the British Museum syntypes of *C. nux* in which their figure 13 appears to be Reeve's figured syntype. Examination of the syntypes will verify the identities of these two types.

The species of coralliophilid associated with

Palythoa ignota appears to this observer to be *Coralliophila nux* (Reeve, 1846). As another discussant said, "What's the problem, *nux* is the short fat one and *parva* is longer?" This seems to be the best criterion. The real point is that if you would like to find this species, look for the zoanthid and feel between the anemones, *C. nux* will be found feeding on the common base of the zoanthid.

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A NEW RECORD FOR *CYPRÆCASSIS TENUIS*
(GASTROPODA: CASSIDAE) OFF THE PACIFIC COAST
OF BAJA CALIFORNIA DEL SUR, MÉXICO

HENRY W. CHANEY

Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

Although *Cypræcassis tenuis* (Wood, 1828) is well known as the largest of the living cassids from the Panamic Province, its relative rarity has meant that the extent of its distribution within this region is continuing to be defined. From Baja California, Abbott (1968) listed specimens taken from Isla Carmen and Cabo San Lucas. He also cited records from Islas Tres Mariás, Clipperton Island and the Galápagos. Shasky (1989) has also reported on this species from Isla del Coco (where I collected dead and broken specimens in 1991 and 1992). Emerson (1995) listed the species as also occurring at Isla Clarión and Islas Revillagigedo. While Keen (1971) stated that *C. tenuis* occurs from La Paz to Ecuador, the southern limits of its distribution along the mainland have not been detailed because generalized reference to "Ecuador" may often just apply to the Galápagos. For these islands, Finet (1994) has summarized records of occurrence. To these reports can be added the very large, 168 mm specimen collected by Wayne Harland in February 1988 from Isla Rábida [Jervis I.] (Harland, 1988).

In recent years a large number of specimens have been collected from the central part of the Golfo de California, in the vicinity of Mulegé, and in July 1993 we collected several specimens from Isla San Pedro Martir (29°25'N). There have been no published reports which have extended the range of *C. tenuis* past this point into the northern Gulf.

Records of *C. tenuis* along the Pacific coast of Baja California have previously been unreported. Because many taxa from the Panamic Province are found as far north as Isla Cedros, it would be expected that beach shells of *C. tenuis* have probably been collected historically throughout this region as conspicuous souvenirs. In fact the only record I found in local

collections was a beach worn fragment at the Los Angeles County Museum of Natural History (LACM 67-72.12) taken by James McLean in December 1967 from northeast of Punta Belcher, Bahía Magdalena (24°36'N).

This note reports the collection of living specimens from a shoal approximately 100 miles northwest of Bahía Magdalena. On 2 November 1995, John Kirkpatrick of the vessel "Megalodon" collected four adult specimens of *Cypræcassis tenuis* from 30 m at the "13 Fathom Spot" (25°43.076N, 113°07.858W). All four shells were exposed in sand pockets. The largest specimen taken (SBMNH 55247) measured 143 mm and is shown here in Figures 1 and 2. The other three specimens are held in the collections of John Jackson and Larry Buck. Readers are encouraged to report any additional records which may extend the known range of this species, either up the Pacific coast of Baja California, into the northern regions of the Gulf, or south to the mainland of South America.

ACKNOWLEDGMENT

My thanks to Larry Buck for the donation of the specimen of *Cypræcassis tenuis* to the SBMNH collections.

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HARLAND, WAYNE

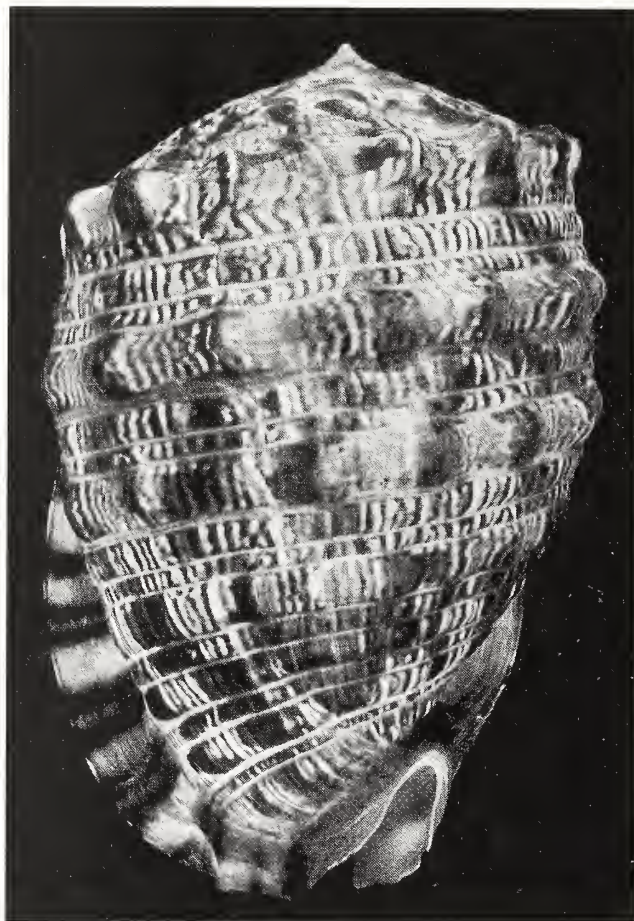
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1989. My last seven years - at Cocos Island. The Festivus 21(8):72-75, figs. 1-4.



Figures 1, 2. *Cypraecassis tenuis* (Wood, 1828), 143 mm L, SBMNH 55247 (1) apertural view (2) dorsal view.

MUREXIELLA VENUSTULA FROM THE GALÁPAGOS
WITH AN ILLUSTRATION OF ITS PROTOCONCH

CAROLE M. HERTZ¹

Associate, Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road,
Santa Barbara, California 93105, USA

After identifying some small muricids from the Kirstie L. Kaiser Collection from the Islas Galápagos, Dr. Emily Vokes had suggested figuring the beautiful protoconch on a tiny (2.0 mm) juvenile specimen of *Murexiella venustula* Poorman, 1983 (Figures 1, 2).

The species was described as containing five whorls with a three-whorled turbinate protoconch, the protoconch of the mature specimen illustrated by a camera lucida drawing (Poorman, 1983, fig. 5). Details of the protoconch of this 2 mm specimen shown in camera lucida drawings (Figures 3, 4), highlight the highly foliose spines at the onset of the

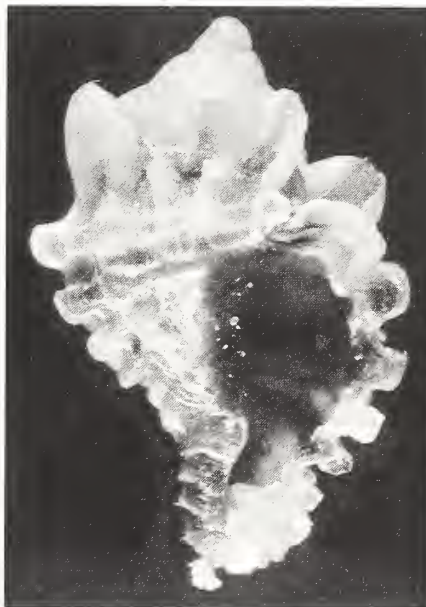
teleoconch seen in Figures 1 and 2. These spines are most likely more worn on mature specimens such as the holotype..

Emily H. Vokes identified the small muricids in the Kirstie L. Kaiser collection, David K. Mulliner photographed the specimens, and Joyce Gemmell made the camera lucida drawings. I greatly appreciate their help.

LITERATURE CITED

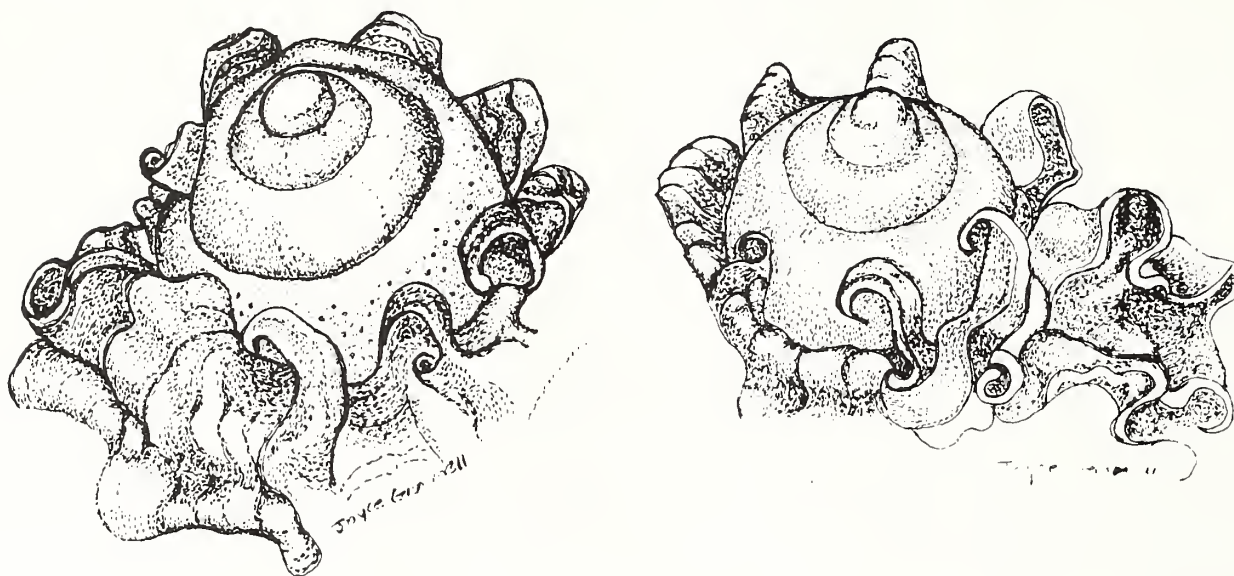
POORMAN, LEROY H.

1983. New molluscan species (Gastropoda: Neogastropoda) from the tropical eastern Pacific. *The Veliger* 26(1):5-9, figs. 1-7.



Figures 1 & 2. *Murexiella venustula* Poorman, 1983. 12 mm L, Isla James, Islas Galápagos, Ecuador, intertidal, turnable lava rock. Leg. K. L. Kaiser, February 19, 1988, K. L. Kaiser collection, (1) dorsal view (2) apertural view. Photos: D. K. Mulliner.

¹ Mailing address: 3883 Mt. Blackburn Ave., San Diego, CA 92111, USA



Figures 3 & 4. *Murexiella venustula*, camera lucida drawings of protoconch of specimen shown in Figures 1, 2. (3) dorsal view (4) apertural view.

TWO MEETINGS ANNOUNCED

Federal and International Scientific Permits: a workshop for natural history museums and collectors.

January 29-31, 1997 are the dates for this meeting presented by the San Diego Natural History Museum (SDNHM) and the Association of Systematics Collections (ASC). The meetings will be held at the SDNHM in the official languages of English and Spanish with simultaneous translation facilities provided. Registration (before November 15) @ \$250; after November 15 @ \$300. Guest ticket (evening only) @ \$20.

For further information concerning program and special events, contact: Permits Workshop Registration, Director, Collections Care and Conservation, San Diego Natural History Museum, P.O. Box 1390, San Diego, CA 92112, USA.

Phone (619) 232-3821, x226 or FAX (619) 232-0248 or e-mail LIBSDHNM@CLASS.ORG

Southern California Malacologists Meeting.

An informal meeting of short talks or presentations on topics in malacology or current research projects in the format of the Bay Area Malacologists will be held on Saturday, January 11, 1997 at the Department of Geological Sciences at San Diego State University. There is no fee for this meeting.

Anyone interested in attending or giving a presentation should contact either: Kent Trego, 441 Ravina St., #3, La Jolla CA 92037 phone (619) 456-7655 or George Kennedy, Dept. of Geological Sciences, SDSU, San Diego CA 92182-1020 FAX (619) 594-4372.

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THE FESTIVUS

A publication of the San Diego Shell Club

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November 14, 1996

Number: 11

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The Festivus is published monthly except December. The publication date appears on the masthead above. Single copies of this issue: \$5.00 plus postage.

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Meeting date: third Thursday, 7:30 PM
Room 104, Casa Del Prado, Balboa Park

PROGRAM

New Contributions to the Paleontological Record in San Diego County

Dr. Thomas A. Deméré, Curator of Paleontology at the San Diego Natural History Museum, will give an illustrated talk on paleontological field work in coastal San Diego County

over the last 16 years with resultant discoveries of many new fossil-producing localities with fossils from the Cretaceous through the Pleistocene.

Meeting date: 21 November 1996
Shells of the month: Southern California fossils

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CLUB NEWS

From the Minutes of the Meeting of the San Diego Shell Club, 17 October 1996

Bill called the meeting to order at 7:50 p.m. The minutes of the August meeting were accepted as published in **The Festivus**. Bill thanked the Arnolds again for hosting a terrific party. Bill told everyone to mark their calendars for the Christmas Party on Saturday, December 14 at the Four Points Sheraton Hotel. The cost and menu are the same as last year: \$23. per person for the choice of Chicken Marsala, Roast Pork with apple cinnamon stuffing, or a Vegetarian Plate. The Club will provide dinner wine and there will be a no-host bar. Kay Klaus explained that there will be a shell exchange. Participants are asked to bring a gift-wrapped shell and put only the general location on the box. The Christmas Party is also the time for the installation of officers for the new year.

On behalf of the Board, Bill presented the following names for the 1997 officers: Terry Arnold for President, Wes Farmer for Vice-President, Margaret Mulliner for Treasurer, Kim Hutsell for Corresponding Secretary, and Silvana Vollero for Recording Secretary. The election of officers will take place at the November meeting.

Bill also mentioned that there were several flyers at the front table regarding publications and information on the Shell Desk Diary. If there are enough members interested in purchasing the calendar, the Club can order them with a discount.

Wes Farmer asked about a Botanical Garden Foundation Rep. The Club still does not have one. No one at the meeting volunteered for the position. The next date of the informal get-together at Kay's house is on Saturday, November 16. Call Kay for details.

Terry Arnold introduced the evening's speaker, Craig Sherman. Craig is a private practice attorney who is working with a group called Environmental Advocates on a lawsuit to clean up San Diego Bay. His talk focused on what is being done, what are the current conditions, and what are the goals for the future. The San Diego Bay is the first major project of Environmental Advocates. Though there are a lot of jurisdictions involved, the Port District is the primary oversight body whose purpose is to promote fisheries,

commerce, navigation, and recreation in the Bay.

Some of the current conditions include sediment impairment, toxic hot spots, pollutants, fish population decline, and human health implications. Craig mentioned that some of the problems are being created by decisions of the District itself, development projects in environmentally sensitive areas, lack of enforcement, storm drain run-off, hot water drained into the Bay by the power plant, and boat activity. Craig suggested some actions which can be taken which do not cost an unreasonable amount of money. These were: applying allocated moneys to areas of concern, approaching the scientific community for their ideas, and partially treating storm water. Some options also include fish and shellfish farms and replanting eel grass. For more information on the work of Environmental Advocates, contact John Hartley, President, at 619-299-9970. Craig's talk led to many interesting questions and comments from Club members since we all share a concern for the environment of the Bay.

The winner of the door prize was Jean Danko. The meeting was adjourned for refreshments and conversation at 8:50 p.m.

Silvana Vollero

The Club Christmas Dinner Party

As noted in the Minutes, the Club Christmas Party will be held on Saturday evening December 14th at the Four Points Hotel at 8110 Aero Drive in San Diego - cocktails at 6 p.m., dinner at 7 p.m. The dinner menu choices and prices (\$23 per person including tax and gratuity) are the same as last year. When you make your reservation, please note on the check which entree you prefer - the Chicken Marsala, Roast Pork or a Vegetarian Plate. Dinner reservations must be received by Friday December 6th. And do participate in the shell gift exchange. It's great fun!

Ask the Four Points Hotel for the special holiday rate of \$53 + occupancy tax if you wish to spend the night at the hotel. Call them at 619-277-8888.

Dues are Due

Dues for 1997, the same as in 1996, are due. Please remit with "pink slip" included with this issue.

RECENT SPECIES OF THE GENUS *PETRICOLA* IN THE EASTERN PACIFIC [BIVALVIA: VENEROIDEA]

EUGENE V. COAN

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In the course of preparing a volume on the bivalves of the northeastern Pacific, my attention was drawn to some nomenclatural problems involving the bivalve genus *Petricola*. The eventual result was an effort to stabilize their species-level taxonomy.

The taxonomic units at the generic level in the Petricolidae and, indeed, at the family level within the Veneroidea, are much in need of modern treatment. While I did not endeavor to prepare a cladistic analysis of the family or superfamily, I attempted to lay a stable foundation for such studies by reviewing previous work on the morphology and biology of species in the *Petricola* complex and providing a brief analysis of the nomenclature of relevant genera.

There are more petricolas in the eastern Pacific than anywhere else in the world, and they proved difficult to understand. Table 1 is a listing of the eastern Pacific and western Atlantic petricolid species. Unlike *Petricola carditoides*, one of the most common marine bivalves on the West Coast, many other taxa are rare, making it difficult to understand the limits of their variability. There is also a high proportion of missing type material, compounded by early, cryptic, unillustrated descriptions. However, I was able to locate type material for most of the species-level taxa, and 15 lectotype designations will be made in my formal paper.

There is a considerable literature on the anatomy, functional morphology, and behavior of some members of the Petricolidae, beginning with observations by Deshayes and Philippi in the 1830s and 40s on the Mediterranean *Petricola lithophaga* and Gould on the American *Petricolaria pholadiformis*. Fischer added anatomical information about the eastern Pacific *Petricola denticulata* and the Caribbean and Pacific *Choristodon robustum* in the late 1850s.

A thin scattering of additional information appeared over the next 100 years, until Purchon's major study on *Petricolaria pholadiformis* and Yonge's discussion of the eastern Pacific *Petricola carditoides*. Narchi

described the functional morphology of *Choristodon robustum* and of his new *Petricolaria stellae*, and Morton reviewed the functional morphology of *Claudiconcha japonica*, a nestler in which the margin of the right valve curls around and partly encloses the left. Nielsen discussed *Petricola lapicida*, type species of the genus *Petricola*, and provided evidence that burrowing might be aided by chemical action. Morton discussed the anatomy of the eastern Pacific *Cooperella subdiaphana* and synonymized the Cooperellidae with the Petricolidae. (The two species of *Cooperella* are listed below but not further discussed.)

The basic family-level characters of the Petricolidae are three cardinal teeth in the left valve and two in the right, as opposed to the Veneridae, which has three teeth in each and sometimes laterals as well. However, it is possible that the loss of a cardinal tooth in the right valve has occurred independently at least twice in taxa that have been allocated to the Petricolidae, making it an artificial group. I am fairly certain that the species I am treating, which additionally have radial sculpture and a nestling or boring habitat, probably belong within the same clade.

Within our taxa, many species have a characteristic shape. For example, species of *Petricolaria*, which penetrate soft substrata are always elongate, whereas *Choristodon robustum*, which nestles in cavities in hard calcareous substrata, is always ovate. However, other species, can vary enormously in shape. External sculpture is very useful and often diagnostic. Radial sculpture predominates, but commarginal elements may also be present.

The shape of the pallial sinus is an important character in petricolids, particularly its depth, the extent to which it is horizontal or is dorsally directed, and whether it is rounded or pointed anteriorly. The pallial line may be coincident or entirely separate from the pallial sinus and may be bowed dorsally anterior to the sinus.

Nearly all the species treated have two cardinal

teeth in the right valve and three in the left, but the left anterior cardinal may be absent in the adult, or in one species it may be lacking entirely at all sizes. The hinge and teeth differ in their size and robustness, and in such details as which are bifid. The extent to which the external ligament is sunken below the hinge margin is also important. Although most species are drab, being white or tinged with brown, color pattern can provide important clues, and one species is bright red internally.

At present, I see no clear basis for separating the genus *Petricola* from the subsequently named genus *Pseudoirus*, which was established for a Japanese species, chiefly on the basis that it does not occur in coral. Members of *Petricola*, s.s. have fine, divaricate, sometimes zig-zag sculpture, an ovate shape, and a well-sunken ligament.

Eastern Pacific species include the very rare *Petricola botula* Olsson, 1961, known from only five lots, which occurs from Mazatlán, Sinaloa, Mexico, to Panamá, boring into rock or clay.

Petricola carditoides (Conrad, 1837) (Figures 1, 2) is the most common Californian species, and it has eight synonyms because of its variable shape [*californica* Conrad, *legumen*, *arcuata*, *cylindracea* and *mirabilis* Deshayes, *gibba* Middendorff and *abrupta* and *pedroana* Conrad]. A difficult nomenclatural problem concerns *mirabilis* Deshayes, which, although described from California, was attributed to Japan by Lischke, and subsequent workers did not question this. However, its holotype is a specimen of *P. carditoides*. In the meanwhile, the distinct Japanese species being called *mirabilis* was made the type species of the genus *Pseudoirus*. The common Californian species [516 lots] occurs from southeast Alaska to southern Baja California, nestling in rocky areas. It is known from deposits as old as the Pliocene, but Miocene records are probably in error.



Figure 1. *Petricola (Petricola) carditoides* (Conrad, 1837). Holotype of *P. mirabilis* Deshayes, 1853. Monterey, California. Length: 35.9 mm.

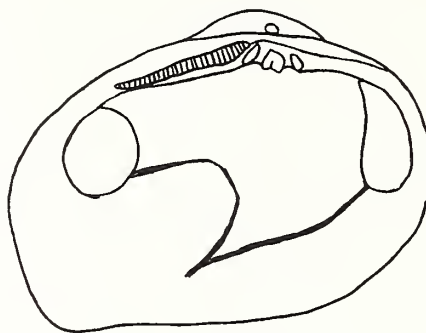


Figure 2. *Petricola (Petricola) carditoides*. CAS 102524. Monterey, California. Left valve. Length: 32.7 mm.

Petricola (Petricola) linguafelis Carpenter, 1857, (Figure 3) with two synonyms [*scobina* Conrad and *noemi* de Folin], never exceeds about 7 mm. It occurs from Baja California Sur and Sinaloa, México, to Ecuador. It is known from 23 lots. It has a very distinctive beaded sculpture that sets it apart from the young of related taxa. Its affinities seem to be with *Petricola*, s.s., of which it may be a pedogenic derivative. I have examined a valve from the Bahamas that is similar and may be an undescribed homologue.

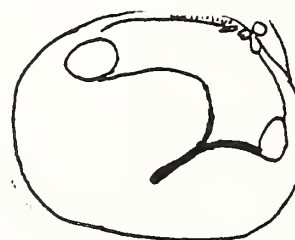


Figure 3. *Petricola (Petricola) linguafelis* Carpenter, 1857. LACM 70-9. Salinas, Guayas Province, Ecuador. Left valve. Length: 4.2 mm.

Petricola (Petricola) lucasana Hertlein & Strong, 1948, (Figure 4) occurs from Puerto Peñasco, at the head of the Golfo de California to Ecuador. The unique type of the synonymous *Petricola charapota* Olsson, 1961, from Ecuador has its beaks very close to the anterior end, whereas in the Golfo de California, *lucasana* tends to assume an oval outline, sometimes becoming higher than long. However, there is a scattering of material that bridges this morphological gap. I've examined 73 lots.

Several species are tentatively placed in the subgenus *Petricolirus*, based on the Japanese *Petricola aequistriata* G. B. Sowerby II, 1874. Members of this subgenus have an elongate shape and radial sculpture

that is generally more conspicuous than that in *Petricola*, s.s. and that is neither divaricate nor zig-zag, and the ligament is not sunken.

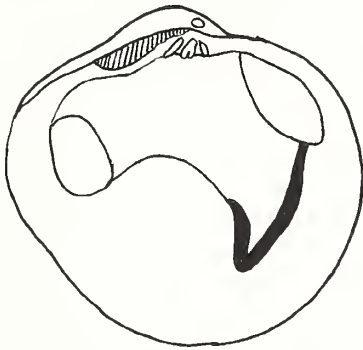


Figure 4. *Petricola (Petricolirus) lucasana* Hertlein & Strong, 1948. CAS 102518. Puerto Peñasco, Sonora, México. Left valve. Length: 22.3 mm.

Petricola (Petricolirus) californiensis Pilsbry & Lowe, 1932, (Figures 5, 6) occurs from Santa Barbara County, California, to Baja California Sur, and is recognized for the first time from the Golfo de California to Oaxaca, nestling in a variety of substrata, including teredinid burrows in driftwood, where it becomes extremely elongate. *Petricola pectarosa* (Conrad, 1834) from the Pliocene and Pleistocene of eastern North America may be its ancestor. I have seen 251 lots.

Petricola (Petricolirus) concinna G. B. Sowerby I, 1834, (Figures 7, 8) is a rare Ecuadorian species, occurring from Esmeraldas to La Libertad and in the Galápagos. I have found only 8 lots.

Petricola (Petricolirus) dactylus G. B. Sowerby I, 1823, (Figure 9) is a previously unrecognized senior synonym of *Petricola patagonica* d'Orbigny, 1845. It occurs from Uruguay to southern Chile. The name *P. dactylus* was misapplied to specimens of *Petricolaria pholadiformis* from the northwestern Atlantic. As a consequence, its proper place as a senior synonym of *P. patagonica*, confirmed here by the discovery of its holotype, has been overlooked. *Petricola chiloensis* Philippi is a probable synonym. I have seen 32 lots.

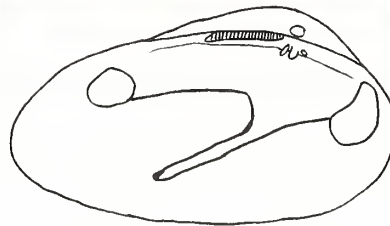
The common Panamic *Petricola (Petricolirus) denticulata* G. B. Sowerby I, 1834, (Figures 10, 11) has three synonyms [*denticulata abbreviata* Sowerby, *peruviana* Jay, and *ventricosa* Deshayes] and occurs from Baja California to Perú. It is relatively common, and I've studied 181 lots.

The South America *Petricola (Petricolirus) rugosa*

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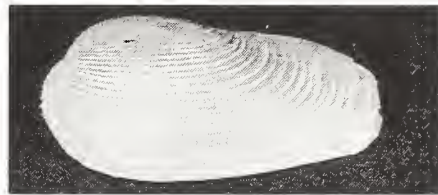


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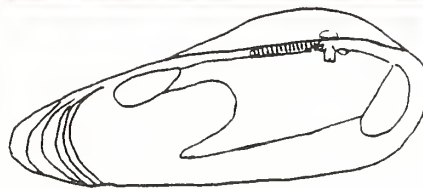


Figures 5, 6. *Petricola (Petricolirus) californiensis* Pilsbry & Lowe, 1932. (5) Holotype, ANSP 114337. San Pedro, California. Length: 26.5 mm. (6) Socorro, Baja California, México. Left valve. Length: 28.3 mm.

7



8



Figures 7, 8. *Petricola (Petricolirus) concinna* G. B. Sowerby I, 1834. (7) Syntype BM(NH) 19665. Montecristi [Manta], Ecuador. Length: 21.1 mm. (8) LACM 71.50.1. Bahía Bartolomé, Isla Bartolomé, Islas Galápagos. Left valve. Length: 20.3 mm.

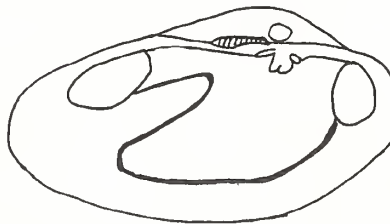
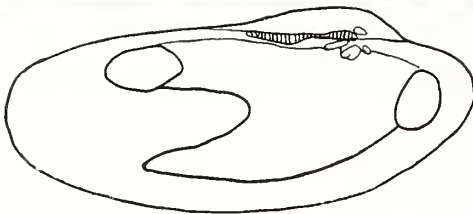


Figure 9. *Petricola (Petricolirus) dactylus* G. B. Sowerby I, 1823. SBMNH 133419. Punta Arenas, Magallanes Province, Chile. Left valve. Length: 25.6 mm.

10



11



Figures 10, 11. *Petricola (Petricolirus) denticulata* G. B. Sowerby I, 1834. (10) Lectotype of *Venerupis peruviana* Jay, 1839. AMNH 56118. Perú. Length: 27.2 mm. (11) CAS 024296. Canoa, Manabí Province, Ecuador. Left valve. Length: 33.5 mm.

G. B. Sowerby I, 1834 (Figure 12), with five confirmed or probable synonyms [*tenuis* Sowerby, *costata* and *rhysodes* Philippi, *ovata* Troschel, and *calderensis* Conrad], occurs from Perú to Chile. It is highly variable in shape and sculpture, with some specimens being almost cylindrical and others flattened and expanded. The sculpture varies from subdued to heavy. I have examined 37 Recent lots.

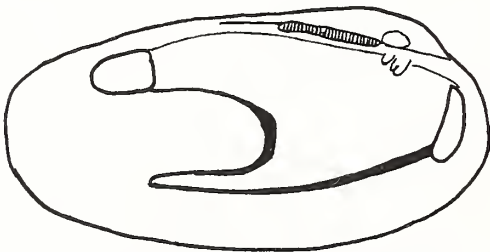


Figure 12. *Petricola (Petricolirus) rugosa* G. B. Sowerby I, 1834. ANSP 323775. Lurin, Lima Province, Perú. Left valve. Length: 33.5 mm.

One is left with several species that cannot be assigned to named subgenera. These include *Petricola exarata* (Carpenter, 1857) (Figure 13), which occurs from central Mexico to northern Peru, nesting in

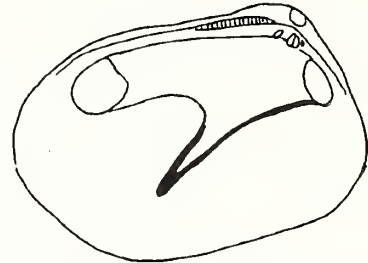
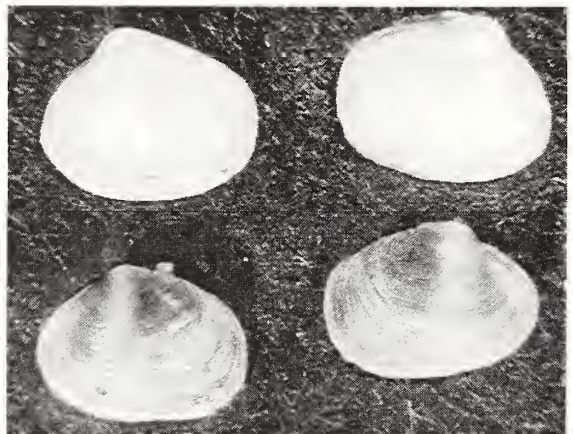


Figure 13. *Petricola exarata* (Carpenter, 1857). CAS 102591. Altata, Sinaloa, México. Left valve. Length: 13.5 mm.

crevices in rocky areas near mangrove swamps. It is represented by 34 lots.

Petricola "A" is a new species (Figures 14, 15) that occurs from southern California to Bahía Magdalena, Baja California Sur, where it occurs in association with algae. This species, rarely attaining more than 8 mm, was previously known as *Petricola tellimyalis* (Carpenter, 1864). However, the tiny holotype of *tellimyalis* is not a *Petricola*, but rather a previously unrecognized synonym of the bernardinid *Halodakra subtrigona*, leaving the small *Petricola* nameless. It is represented in collections by 55 lots.

14



15



Figures 14, 15. *Petricola* sp. "A." (14) two potential paratypes. San Pedro, California. Length: ~5.3 mm. (15) Left valve. Potential paratype, CAS 106035.

Petricola olssoni Bernard, 1983, (Figure 16) occurs from Perú to Chile, and 22 lots have been studied. It is a renamed homonym [*Petricola peruviana* Olsson, 1951, *non* (Jay, 1839)]

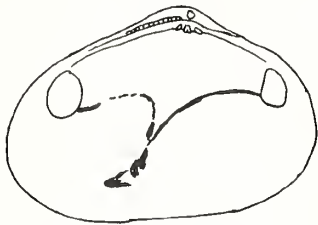


Figure 16. *Petricola olssoni* Bernard, 1983. ANSP 252061. Peninsula Paracas, Ica Province, Perú. Composite of two specimens; lengths: 12.3 & 15.0 mm.

Petricola "B" (Figure 17) is a second new species. It occurs from Panamá to Ecuador. As yet known from only 9 lots, it was figured but not discussed by Olsson (1961: pl. 55, fig. 11).

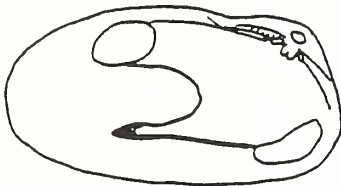
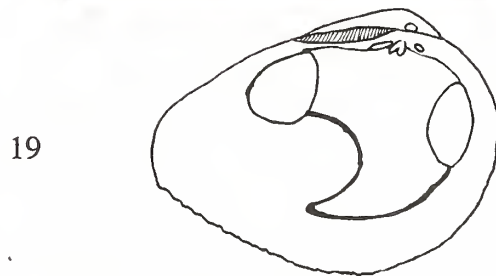


Figure 17. *Petricola* sp. "B." Potential holotype. Left valve. Length: 16.9 mm.

I am recognizing *Choristodon* as a full genus characterized by a thick shell, heavy radial sculpture, a sunken ligament, and a hinge that becomes highly distorted in large specimens. *Choristodon robustum* (G. B. Sowerby I, 1834) (Figures 18, 19) has eight synonyms [*typicum* Jonas, *robusta* Philippi, *sinuosa* Conrad, *bulbosa* Gould, *anchoreta* and *venusta* de Folin, *buwaldi* Clark, and *riocanensis* Maury], and occurs from central Baja California to Perú, and in the western Atlantic from North Carolina to Brazil, in calcareous substrata, such as shells of *Spondylus* and colonial corals. I have studied 82 Recent eastern Pacific lots. It had long been recognized that the eastern Pacific *robustum* G. B. Sowerby I, 1834, is very similar to the Caribbean *typica* Jonas, 1844, type species of *Choristodon*. Woodring (1982) synonymized them, placing the senior *robustum* into the synonymy of the junior *typica*. There seem to be subtle differences between Caribbean and Pacific material, including maximum size, shape, and color, but I am leaving them in synonymy pending future, more detailed study by other workers. Woodring also placed *Petricola*

riocanensis Maury, from the Miocene of Dominican Republic, into the synonymy here, and my examination of the type specimen of the Miocene *P. buwaldi* Clark from central California demonstrates that it is also within the range of variability of this species.

One additional Atlantic species has also been placed in *Choristodon*, *Choristodon cancellatus* Verrill, 1885, (Figure 20) described from off Chesapeake Bay in 70 fm [128 m]. This taxon was based on one worn left valve measuring 7.7 mm in length, 6.2 mm in height, and 3.0 mm in thickness [USNM 44839] (Verrill, 1885: 435-436).



Figures 18, 19. *Choristodon robustum* (G. B. Sowerby I, 1834). (18) Holotype, *Petricola bulbosa* Gould, 1851. MCZ 169065. Guaymas, Sonora, México. Length: 27.8 mm. (19) SBMNH 143212. Bahía San Carlos, Sonora, México. Left valve. Length: 21.8 mm.

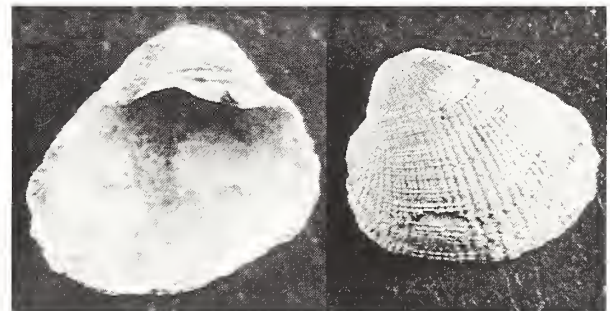


Figure 20. *Choristodon cancellatus* Verrill, 1885. Holotype, USNM 44839. "off Chesapeake Bay." Length: 7.7 mm.

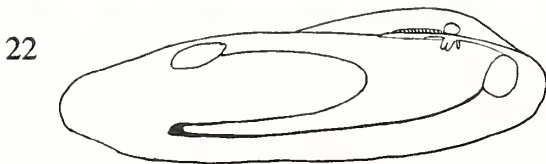
This unique holotype is not a petricolid, but I am not certain what it is. It is possible that it is from an offshore fossil locality.

Petricolaria is also tentatively afforded generic status, and is represented in the eastern Pacific by two species, one native and one introduced.

The native species is *Petricolaria cognata* (C. B. Adams, 1852) (Figures 21, 22). This is the oldest name for what has mostly gone under the name *parallela* Pilsbry & Lowe. It occurs from Baja California to Ecuador, in soft substrata, such as clay banks. The holotype of *P. cognata* is a short, thick, but not highly unusual specimen. I have studied 91 lots. There is a group of tropical species of *Petricolaria* that account for mistaken records of the Northern Hemisphere *Petricolaria pholadiformis* in the Southern Hemisphere. These include *P. gracilis* (Deshayes, 1853), which occurs in the Indian Ocean and the Red Sea, *Petricolaria stellae* Narchi, 1975, occurring from Brazil to Uruguay, and *Petricolaria serrata* (Deshayes, 1853), described from an unknown locality. The relationships among these three taxa have yet to be resolved.



21



22

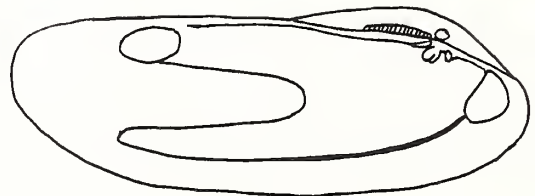
Figures 21, 22. *Petricola cognata* (C.B. Adams, 1852). (21) Holotype of *Petricola gracilis parallela* Pilsbry & Lowe, 1932. ANSP 155591. Corinto, Nicaragua. Length: 28.7 mm. (22) SBMNH 143213. Cochoire, Guaymas, Sonora, México. Left valve. Length: 43.7 mm.

Petricolaria pholadiformis (Lamarck, 1818) (Figures 23, 24) was introduced on the West Coast, and now survives in low numbers in two bays. It has six synonyms [*fornicata* and *flagellata* Say, *carolinensis* Conrad, *tumida* Verrill, *pholadiformis lata* Dall, and *rogersi* McGavock]. It came with oysters in three localities in the northeastern Pacific: Willapa Bay, Washington, and San Francisco and Newport bays, California, but it did not survive in Newport Bay, and it does not seem to have spread beyond Willapa and

San Francisco bays, where it burrows in clay. In its native habitat in the western Atlantic, it occurs from Canada to the Golfo de México. It was also introduced into the eastern Atlantic, and it now thrives from Norway to the Black Sea. I have examined 32 eastern Pacific lots.



23



24

Figures 23, 24. *Petricolaria pholadiformis* (Lamarck, 1818). (23) Holotype 1082/97, Museum d'Histoire Naturelle, Geneva. Length: 46.0 mm. (24) CAS 012508. Woods Hole, Barnstable Co., Massachusetts. Left valve. Length: 39.8 mm.

I have been able to exclude a number of taxa that are either non-petricolids or are *nomina dubia*. One of these is *Ungulina luticola* Valenciennes, 1846, which was described on the basis of four specimens now in the Paris Museum and long regarded as a synonym of *Petricola carditoides*. However, the originally figured specimen is instead *Thracia curta* Conrad, 1837, and the type lot includes specimens of *Petricola*, *Sphenia*, and *Thracia*, members of three different orders of bivalves.

In my formal paper, now under review, I discuss the fossil occurrences of these taxa, give full citations for all of the taxa discussed, and provide a run-down on related generic units in the family and their characters. In several cases, the type species of the genera and their methods of designation have been confused in previous literature.

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Table I. List of Eastern Pacific and Western Atlantic Petricolidae

EASTERN PACIFIC

Petricola (Petricola) botula Olsson, 1961
Petricola (Petricola) carditoides (Conrad, 1837)
Petricola (Petricola) linguafelis Carpenter, 1857
Petricola (Petricola) lucasana Herlein & Strong, 1948
Petricola (Petricolirus) californiensis Pilsbry & Lowe, 1932
Petricola (Petricolirus) concinna G. B. Sowerby I, 1834
Petricola (Petricolirus) dactylus G. B. Sowerby I, 1823
Petricola (Petricolirus) denticulata G. B. Sowerby I, 1834
Petricola (Petricolirus) rugosa G. B. Sowerby I, 1834
Petricola "A"
Petricola "B"
Petricola exarata (Carpenter, 1857)
Petricola olssoni Bernard, 1983
Choristodon robustum (G. B. Sowerby I, 1834)
Petricolaria cognata (C. B. Adams, 1852)
Petricolaria pholadiformis (Lamarck, 1818)
Cooperella subdiaphana (Carpenter, 1864)

WESTERN ATLANTIC

Petricola (Petricola) lapicida (Gmelin, 1791)

Petricola (Petricolirus) dactylus G. B. Sowerby I, 1823

Choristodon robustum (G. B. Sowerby I, 1834)
Petricolaria stellae Narchi, 1975
Petricolaria pholadiformis (Lamarck, 1818)
Cooperella atlantica Rehder, 1943

THE FESTIVUS ANNOUNCES A SUPPLEMENT TO VOLUME XXVIII

The *Festivus* is proud to announce the publication of a supplement to Volume XXVIII. The monograph, by Hugh Bradner and E. Alison Kay, entitled **An Atlas of Cowrie Radulae (Mollusca: Gastropoda): Cypraeoidea: Cypraeidae** will be available to 1996 members/subscribers who wish to receive it, at no cost.

The monograph of 176 pages + index treats over 202 species in 13 patterns and is profusely illustrated with the radulae being shown in both SEM and optical photographs.

For non-members/subscribers, the supplement will be available for sale. The prices, including postage, are as follows: \$25 (domestic), \$28 (overseas surface mail), \$32 (overseas air mail).

Members who wish to receive the supplement must check off the appropriate box on the member renewal pink slip enclosed with this issue.

The Bradner/Kay supplement will be available for mailing in January.

FINDING EPITIONIUMS AT SANTA CRUZ ISLAND, CALIFORNIA

BOB PIKE

7331 Colombia Dr., Buena Park, CA 90620, USA

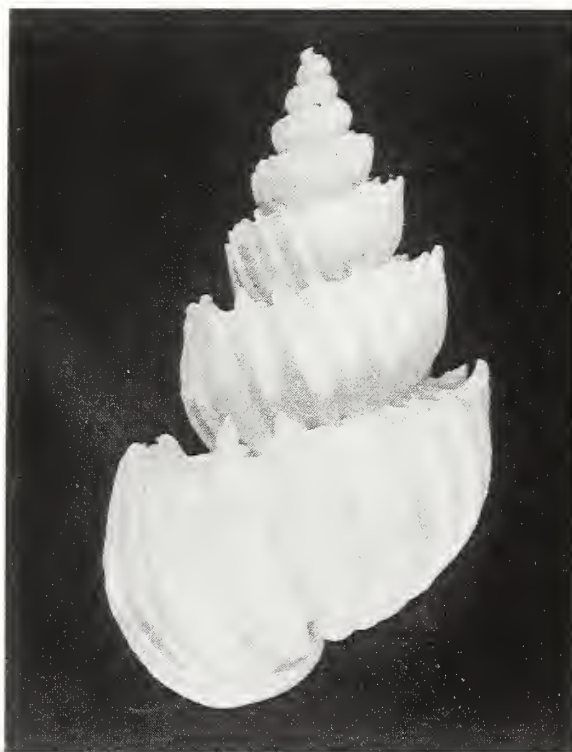
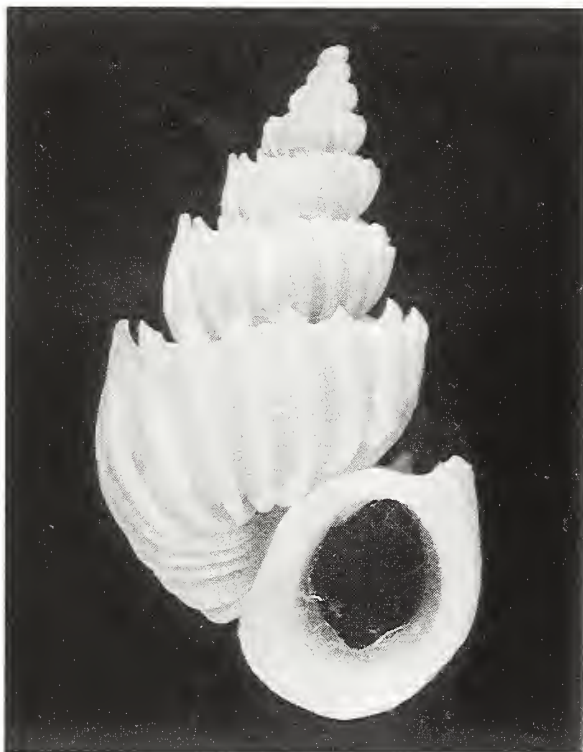
In August 1995, on the last day of the Club's annual Channel Island Dive Trip, we stopped at a place called "The Eagles' Nest" on Santa Rosa Island. The boat anchored in about 40 feet of water, just a few yards from a rock boil facing the beach. The bottom was sand which continued into the rocks at about 20 feet. The spot looked good for halibut, so most of the divers took spear guns in to search for "flatties." The visibility was poor in the shallows which made it hard to look for fish.

The dive theme then switched from fish to shells. Working into the deeper water, I searched the pockets of rubble formed by the bottom surge. After finding a few broken epitoniums, my search focused on these tiny white shells. My last ten minutes of the dive was spent in a wide sweeping pattern starting at 40 feet,

working down to 60 feet and then back up to 40 feet. The results were three live *Nitidiscala sawinae* (Dall, 1903) and two dead ones, all about 25 mm in length. I also found one live 20 mm specimen of *Asperiscala bellastrata* (Carpenter, 1864) (Figures 1 and 2).

According to Helen DuShane, few live specimens of *Asperiscala bellastrata* have been taken and those have been dredged in 18 to 103 m (59-338 ft.) on sand or mud substrate, with a distribution from the Middle Farallon Island, San Francisco County, California, south to the Mexican border. She said that the original specimens are lost and only a fragmented specimen is left. The lectotype, chosen by Palmer in 1958, is a broken specimen from Monterey, California, now in the Smithsonian (USNM 14831b).

My thanks to Helen DuShane for her help.



Figures 1, 2. *Asperiscala bellastrata* (Carpenter, 1864), length: 20 mm. (1) apertural view (2) dorsal view. Photos: D.K. Mulliner.

BOOK NEWS

Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel, Volume 9, The Mollusca Part 2 -- The Gastropoda.

By James H. McLean & Terrence M. Gosliner

1996, vii + 228 pp.; ISBN 0-93649-14X; Paul H. Scott, James A. Blake & Andrew L. Lissner, editors. Price [from the Santa Barbara Museum of Natural History, 2559 Puesta del Sol Road, Santa Barbara, CA 93105]: \$34.00 (comb binding), \$39.00 ("perfect" binding), plus \$4.00 shipping & handling in the USA.

The complex title of this work identifies the gastropod "Atlas" as one of an anticipated 14-volume set on the Fauna of the Santa Maria Basin and the Western Santa Barbara Channel, published by the Santa Barbara Museum of Natural History. The work is intended to provide an illustrated identification manual for the gastropods occurring offshore at depths of 50-500 m in the Point Conception region of southern California (35°N), and much of it also applies to the fauna of the southern California Bight, the entire area from Point Conception to the Mexican Border. "The Gastropoda" volume actually contains two separate articles, one by Jim McLean of the Los Angeles County Museum of Natural History, and one by Terry Gosliner of the California Academy of Natural Sciences in San Francisco. The two parts are independent products, each with their own table of contents, bibliography, etc., and will here be discussed separately.

McLean's part (pages 1-160) is entitled "Prosobranchia," and covers all the non-heterobranch groups spanning from patellogastropod groups such as Lepetidae and Lottiidae to neogastropods such as Turridae and Conidae. This part deliberately leaves out the shallow-water forms previously covered by the same author in his field guide *Marine Shells of Southern California* (1969, revised 1978). McLean provides a general introduction, a glossary of terms, a detailed list of treated species, as well as a key to families (based on the shell characters of species treated in this study). The taxonomic section provides very informative introductions to the families, including diagnoses, taxonomic and biological remarks, and gives carefully researched information on the type species of the included genera. The species listings have the

standard complement of synonymies, material examined, descriptions, type information, distributional and habitat information, as well as miscellaneous remarks. Throughout the work, the author provides dichotomous keys of shell features as identification aids. The "prosobranchs" include 126 species in this work, seven of which are described as new in the families Turbinidae, Vanikoridae, Muricidae and Conidae. A new muricid genus, *Scabrotrophon* McLean, is also introduced. In some cases (e.g., for the genera *Lirobittium*, *Boreotrophon*, and *Crockerella*), the coverage goes beyond the specified geographic region, and here the author provides generic revisions. The species are illustrated by good black-and-white light photographs of the shells that should allow species-level identification for which this work was conceived.

Gosliner's part (pages 161-213) is based on Santa Maria Basin material that includes well preserved specimens of 28 species of "opisthobranchs." It begins with members of the architectibranchs (Acteonidae) and covers the groups traditionally grouped as opisthobranchs, from the shelled cephalaspids to the shell-less nudibranchs. The findings in this part, the first treatment since McDonald & Nybakken's work (1980), contribute significantly to our knowledge of the Pacific coast fauna: half of these species had not previously been recorded from the Pacific coast of North America, and two genera, *Parvaplustrum* and *Holoplocamus*, were known only from the Atlantic Ocean. Gosliner also provides an introduction, a glossary, a list of species, and a dichotomous key (which employs characters of soft body morphology and radula), but he does not group the families into higher categories and does not give diagnoses or author/date citations for the families. The species descriptions are detailed and comparable to McLean's treatment of the "prosobranchs." The illustrations are a combination of excellent SEM photographs, coarse line drawings, and photographs of living animals. The latter, unfortunately, lost much detail in the black-and-white reproduction. A color photograph of *Tritonia festiva* graces the cover.

According to the Acknowledgments section, the study was funded as a contract of the U.S. Department

of the Interior, and voucher material is being divided between the collections of the Santa Barbara Museum of Natural History and the United States National Museum. The editors have added an Appendix with a detailed list and maps of the sampling stations, as well as a complete taxonomic index covering both parts. The focus on traditional groupings of "prosobranchs" and "opisthobranchs" in these two parts left out a number of "lower heterobranch" groups, most notably the family Pyramidellidae. Also missing is an explanation of the entire project; the user of the gastropod volume alone is somewhat at loss to understand references to "Phase I" and "Phase II" of the study. Another little oddity of the work are the figure citations, with figures in McLean's parts numbering 1.1 to 1.29 and in Gosliner's part 2.1 to 2.20. The individual images are indicated by letters; *Epitonium berryi*, for instance, can be found in Figure 1.12A.

Coral Reef Animals of the Indo-Pacific. Animal life from Africa to Hawai'i exclusive of the vertebrates. By Terrence M. Gosliner, David W. Behrens, and Gary C. Williams.

1996. Sea Challengers, Monterey, California
i-vi + 314 pages, 1103 color plates, 6 text figures, and 32 line drawings.
Price: \$45.00

The tropical Indo-Pacific region extends from the Indian Ocean coast of Africa to Hawai'i in the Northern Hemisphere and the Pitcairn Group in the Southern Hemisphere. The region teems with life and supports the richest diversity of marine organisms in the world. Many books have been written on fishes of the Indo-Pacific and are well illustrated with color photographs to help identify the species. There are few guide books, however, to identify Indo-Pacific invertebrates.

Coral Reef Animals of the Indo-Pacific is a new book on invertebrates. The book begins with an excellent discussion on the biology of corals and coral reefs, formation of coral reefs, and biogeography of the organisms inhabiting these reefs. The book is beautifully illustrated with color photographs of 1103 species in 16 phyla. The authors provide information on identification, natural history, and distribution of each species next to the photographs.

Some of the phyla are small and represented in this

The volume, available in a sturdy spiral binding or as "perfect binding" is nicely produced. The Santa Barbara Museum, particularly Paul Scott and his co-editors can be congratulated for a nice (and inexpensive!) production. This book is a "must" for anybody interested in the Californian mollusk fauna.

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1980. Guide to the nudibranchs of California, including most species found from Alaska to Oregon. American Malacologists, Inc., Melbourne, Florida. 72 pp.

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1978. Marine shells of southern California. Los Angeles County Museum of Los Angeles County Science Series, 24 (revised edition): 1-104.

Rüdiger Bieler

book by few species (Ctenophora - comb jellies, Nemertea - ribbon worms, Sipuncula - peanut worms, Echiura - tongue worms, Phoronida - phoronid worms, Brachiopoda - lamp shells, and Hemichordata - acorn worms). Major phyla (Coelenterata, Mollusca, Arthropoda, and Echinodermata) are well represented with nearly 900 species treated in the book. I was pleased to find some of the lesser phyla and groups (Porifera - sponges, Platyhelminthes - flatworms, and Tunicates - sea squirts) well represented in the book with more than 150 species treated.

Kim Hutsell evaluated the sections on the Gastropoda and Bivalvia. He noted the following errors: 437. The host mollusk is *Latirus nodatus* (Gmelin, 1791) not a *Fusinus*. 440. The specimen is *Natica stellata* (Hedley, 1913) not *Neverita didyma*. 518. The prey species is *Conus quercinus* (Lightfoot, 1786) not *Conus flavidus*. 520. The specimen is *Conus episcopus* (Hwass, 1792) not *Conus textile*.

This book will be cherished by biologists, divers, photographers, and others interested in the biology, diversity, and beauty of the tropical Indo-Pacific. The spectacular photographs will help you identify many of the invertebrates you might encounter in this region of the world. The book is a must addition to your library even if you are not fortunate enough to explore and dive the Indo-Pacific.

Ron H. McPeak

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